Z

SERVICE MANUAL
PULSE HEIGHT ANALYZER
MODEL 2056-B

D. S. DAVIDSON COMPANY
INSTRUMENTATION FOR SCIENCE AND INDUSTRY
19 BERNHARD ROAD, NORTH HAVEN, CT 06473
TEL. (203) 288-7324

SERVICE MANUAL MODEL 2056-4K

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D. S. Davidson Co. Inc.

LIMITED FACTORY WARRANTY

D. S. Davidson Co. Inc. manufactured products are warranted against defects in materials and workmanship for a period of one year from date of shipment. Davidson will, at its option, repair or replace the product which proves to be defective provided the product has been used in a proper manner and within Davidson's specifications. Service assistance will be provided when possible by telephone. Service problems not resolved by telephone will require the return of the product to the factory for service. The customer is responsible for shipment costs to the factory.

Since Davidson does not have control over the installation conditions or use for its products, no warranty is made on fitness for a particular purpose or of merchantability.

This warranty will become void if the equipment is modified or serviced by other than Davidson personnel, except with permission to do so from Davidson.

In no event shall D. S. Davidson Co. Inc. be liable for any loss, inconvenience or damage whether direct, incidental, consequential or otherwise. No other warranty is expressed or implied, except as required by law.

In the case of products supplied by Davidson but not originally manufactured, the benefits of the manufacturer's warranty are passed on to the customer when allowed.

For service contact:

TEL. NO. (203) 288-7324
TEL. NO. (203) 776-0335
TELEX NO. 703410

Factory service facility location:

D. S. Davidson Co. Inc.
19 Bernhard Road
North Haven, CT. 06473

SERVICE MANUAL

INTRODUCTION

This manual contains engineering drawings for all the circuit boards of the MCA. For each board there are the following:

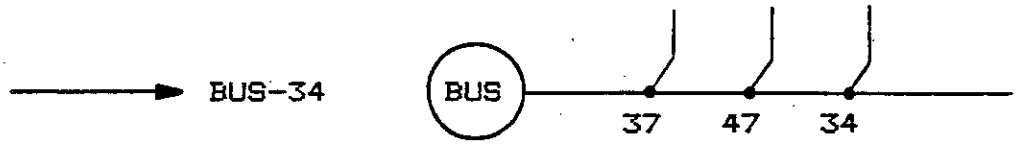
1. Major components board location.
2. Parts list for major components.
3. Circuit diagrams.

FACTS ABOUT THE CIRCUIT DIAGRAMS:

PART NUMBER = U1

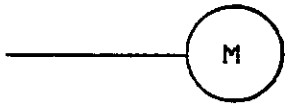
Component location numbers starting with "U" normally have just the number circled on the circuit diagram.

Connections to a connector are marked by a "J" number. The pin number follows a dash or is inside the connector.

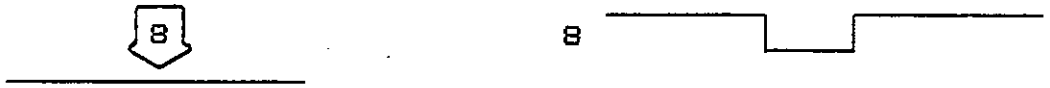


Connections to the mother board are marked by "BUS" followed by a dash and the pin number or taken from a bus originating from the circled word "BUS". Along this bus connections are tapped off and marked with the mother board pin number.

Connections on the same board are marked by an arrow. Arrows which point outward are normally outputs which connect to other arrows which point inward. Arrows usally have a label and the connecting part number followed by a dash and the pin number.



A circled label on a bus shows connections on different diagrams for the same board. Labels wich are the same along a bus are connected together.



A number within an arrow points to a circuit location referring to a wave form from another diagram.

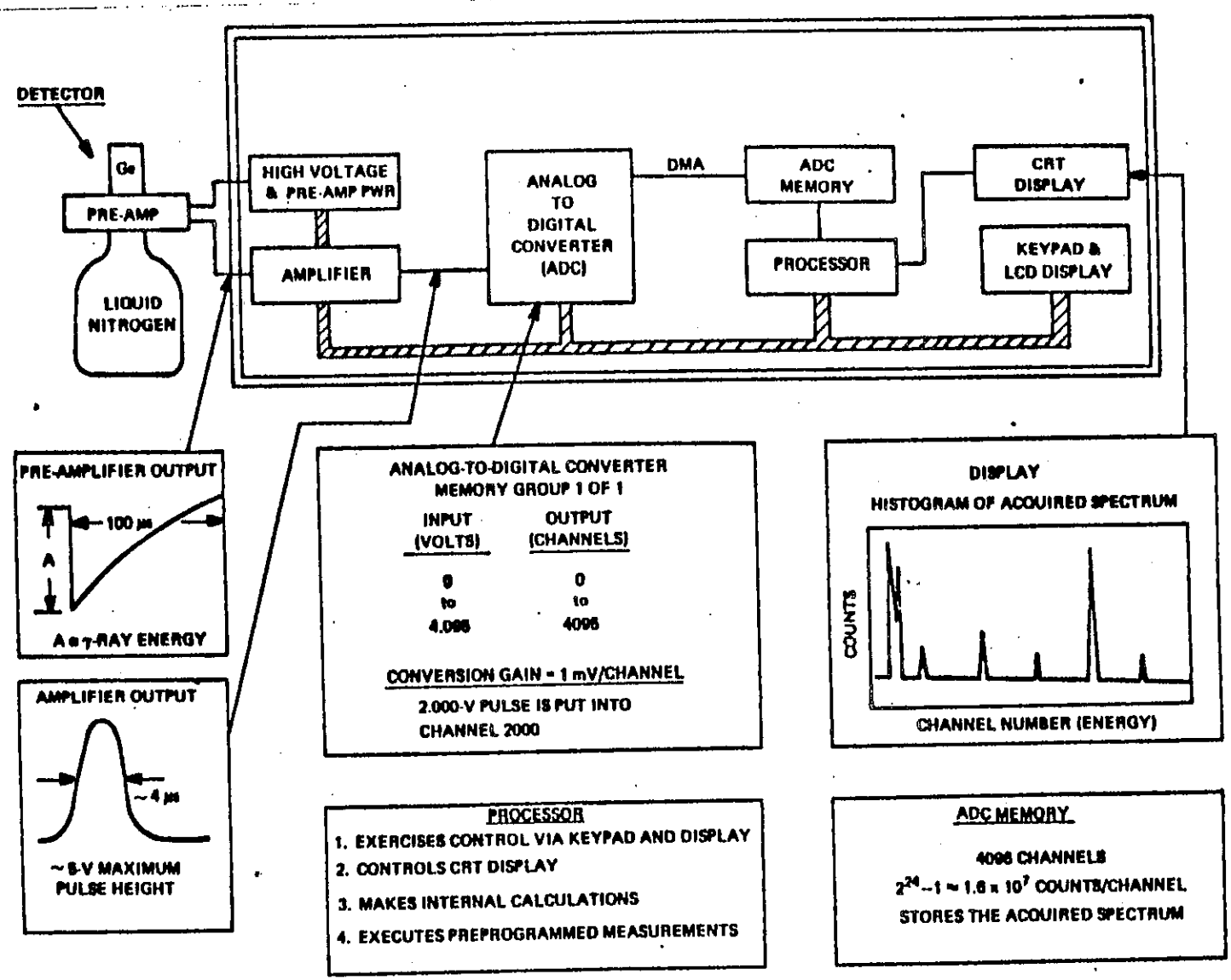


Fig. 1. Diagram of the Davidson 2056-4K multichannel analyzer operations.

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DANGER: Do not remove the safety cover from the HIGH VOLTAGE MODULE.

DANGER: Care should be taken not to touch any high voltage source such as the socket of the CRT display, the FOCUS and INTENSITY controls, and the HIGH VOLTAGE board.

REMOVING THE MCA FROM ITS BOX FOR SERVICE

1. Turn the power off and disconnect the charger.

2. Remove the side cover secured by 2 screws. Remove the 2 D type connectors from the control board (some units don't have them).

3. Remove the high voltage module secured by 4 screws. Remove the 2 coaxial cables from the amplifier board. Remove the cable from the rear of the module.

4. Undo the 4 quarter turn fasteners on the front panel, turning in a counter clockwise direction.

5. Lift the MCA out by the front panel having another person check for cables which might get caught on the inside lip of the box. About half the way out, disconnect the cable from the power supply board located over the battery. Place the MCA upright on a nonconductive surface.

6. Set the box on its back and undo the 2 quarter turn fasteners on the bottom of the box. Set the box upright and undo the 2 quarter turn fasteners on the back of the box. Remove the battery and power supply board from the box.

7. Place the MCA upright on a nonconductive surface. Reconnect the power supply and high voltage module cables to the MCA. Place the modules such that shorts can not occur between the metal and the PC boards or socket of the CRT display.

8. Providing care is taken the MCA may now be powered on for service.

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HOW TO SERVICE THE MCA

After the MCA is removed from the box testing may be done to the ADC AND AMPLIFIER boards ("A"), the low voltage power supply board ("P") or the high voltage board ("H"). The internal boards of the MCA may be serviced by removing the ADC ("A") board.

1. Disconnect the power supply and high voltage module cables. place the MCA face down on a flat surface.

2. Remove the two screws from the amplifier board. Remove the coaxial cable from the top of the board.

3. Remove the ribbon cable with three connectors from the top of the "A", "B" and "D" boards. Using a small screw driver insert into the connector on the "A" board and lift out. Repeat on the other connectors.

4. Remove the "A" board using a medium screw driver to lift up on each side.

5. Reconnect only the power supply cable to the MCA.

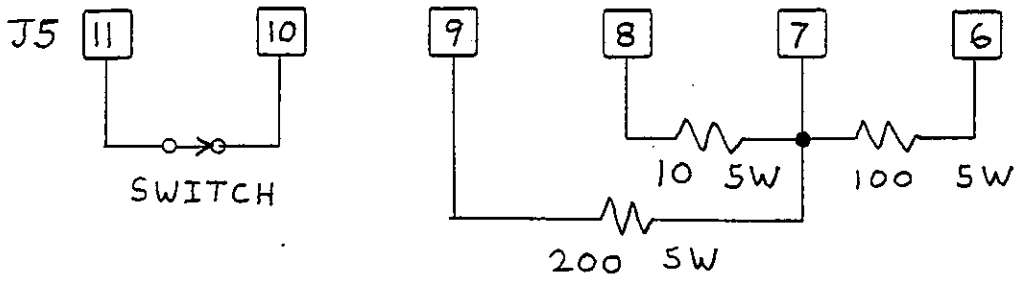
The "B" board may now be tested. The "M" and "C" boards may be tested by swapping there position with the "B" board. The "D" board can be moved to the position of the "A" board, The intensity knob must be kept to the full counter-clockwise position (No display will be on the CRT).

The order of the boards from front to back are:

"A" "B" "D" "C" "M" "H"

The H.V.Multiplier module should not be serviced.

The "P" board should be serviced using dummy loads as shown below.



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SERVICE TIPS

The first step is to check all the power supply voltages in the MCA. Take the MCA out of it's box and check the voltages on the mother board. Pin #1 is on the right. Be careful of ground lines on the mother board.

PIN#	VOLTAGE	DESCRIPTION
3	+5	plus 5 volt supply
4	+12	plus 12 volt supply
5	-12	minus 12 volt supply
6	+10 to +14	battery
8	+10 to +14	switched battery
16	-24	minus 24 volt supply (OPTIONAL)
18	+24	plus 24 volt supply (OPTIONAL)

Check the system signal lines on the mother board. Pin #1 is on the right.

PIN#	SIGNAL	DESCRIPTION
22	normally high	$\overline{\text{NMI}}$ interrupt
32	2 Mhz square wave	Multiplex clock
33	normally high	$\overline{\text{FIRQ}}$ interrupt
34	normally high	$\overline{\text{IRQ}}$ interrupt
35	1 Mhz square wave	Q clock
37	1 Mhz square wave	E clock
38	normally high	$\overline{\text{Reset}}$
39	1 Mhz wave	VMA

Turn the MCA off and then on to observe the LCD window. The LCD is set to all blanks and the system is initialized. Next the LCD shows "SELF TEST IN PROGRESS" and the RAM is tested. If the MCA has not powered up properly the LCD will show one of the following messages.

MEMORY ERROR BAD CHIP=	One of the RAM chips on the MPU board has failed.
DISPLAY BOARD FAULT	The display board has not responded.
MC146818 CLOCK CHIP BAD	There is a fault with the clock chip on the MPU board.

BUS CONNECTIONS ON THE MOTHER BOARD

The mother board is located below the front panel of the MCA. The main boards of the MCA are interconnected on this bus. Pin #1 is on the right looking at the front of the MCA.

PIN #	SIGNAL	DESCRIPTION
1	GND	GROUND
2	GND	GROUND
3	+5 V	+5 VOLT POWER SUPPLY
4	+12 V	+12 VOLT POWER SUPPLY
5	-12 V	-12 VOLT POWER SUPPLY
6	BATTERY	BATTERY CONNECTION FOR BACKUP
7	--	NO CONNECTION
8	SBAT	BATTERY CONNECTION (SWITCHED)
9	--	NO CONNECTION
10	--	NO CONNECTION
11	--	NO CONNECTION
12	HVC	HIGH VOLTAGE CONTROL
13	HVM	HIGH VOLTAGE MONITOR
14	POS	CRT DISPLAY POSITION
15	EXP	CRT DISPLAY EXPAND
16	-24 V	-24 VOLT POWER SUPPLY FOR PREAMP (OPTION)
17	RSD	REMOTE SHUT DOWN FOR HIGH VOLTAGE
18	+24 V	+24 VOLT POWER SUPPLY FOR PREAMP (OPTION)
19	B	MEMORY BANK SELECT
20	$\overline{WE}$	WRITE ENABLE FOR RAM
21	$\overline{S7}$	SELECT LINE 7
23	$\overline{S0}$	SELECT LINE 0 ("A" BOARD)
24	$\overline{S1}$	SELECT LINE 1 ("B" BOARD)
25	$\overline{S2}$	SELECT LINE 2
26	$\overline{S3}$	SELECT LINE 3 ("D" BOARD)
27	$\overline{S4}$	SELECT LINE 4 ("C" BOARD)
28	GND	GROUND
29	GND	GROUND
30	$\overline{S5}$	SELECT LINE 5 ("C" BOARD)

BUS CONNECTIONS ON THE MOTHER BOARD

PIN #	SIGNAL	DESCRIPTION
31	$\overline{S6}$	SELECT LINE 6 ("C" BOARD)
32	M	MULTIPLEX CLOCK
33	$\overline{FIRQ}$	FIRQ INTERRUPT
34	$\overline{IRQ}$	IRQ INTERRUPT
35	Q	Q SYSTEM CLOCK
36	R/W	READ/WRITE
37	E	E SYSTEM CLOCK
38	$\overline{RESET}$	POWER ON RESET
39	VMA	VALID MEMORY ADDRESS
40	A7	ADDRESS LINE 7
41	A3	ADDRESS LINE 3
42	A6	ADDRESS LINE 6
43	--	NO CONNECTION
44	A2	ADDRESS LINE 2
45	A4	ADDRESS LINE 4
46	--	NO CONNECTION
47	A0	ADDRESS LINE 0
48	A5	ADDRESS LINE 5
49	--	NO CONNECTION
50	A1	ADDRESS LINE 1
51	D7	DATA LINE 7
52	D6	DATA LINE 6
53	D5	DATA LINE 5
54	D4	DATA LINE 4
55	D3	DATA LINE 3
56	D2	DATA LINE 2
57	D1	DATA LINE 1
58	D0	DATA LINE 0
59	GND	GROUND
60	GND	GROUND

CONNECTORS

RS-232-C Serial Port

The port is located on the right side of the MCA. It is a 25 pin female connector called I/O RS232. The I/O command sends and receives serial data from this port. A printer, terminal or computer may be interfaced using the standard RS-232 connections and cables. A modem maybe used if a special cable is made up.

PIN #	NAME	INPUT/OUTPUT	
1	PROTECTIVE GROUND		
2	TRANSMITTED DATA	INPUT	
3	RECEIVED DATA	OUTPUT	
4	REQUEST TO SEND	INPUT	NOTE 1
5	CLEAR TO SEND	OUTPUT	NOTE 1
6	DATA SET READY	OUTPUT	
7	SIGNAL GROUND		
8	DATA CARRIER DETECT	OUTPUT	NOTE 2
11	PRINTER HOLD	INPUT	NOTE 3
20	DATA TERMINAL READY	INPUT	

NOTE 1: Pins 4 and 5 are connected together in the MCA.

NOTE 2: Pin 8 has a 4.7K ohm resister to +5 volts.

NOTE 3: Pin 11 is a nonstandard pin it is used by high speed printers to stop I/O when their buffer is full. When the voltage on this pin is between 3 and 12 volts the MCA does not send or receive data from the port.

CONNECTORS

Preamplifier Power Pin Assignments

Located on the right side of the unit is a 9 pin female connector called PREAMP PWR it provides the plus and minus 12 volt power, optional plus and minus 24 volt power required by low power preamplifiers in some detectors. Also, it contains the inputs for the thermistor for Americium doped NAI detectors for temperature stabilization.

PIN #	NAME
1	GROUND
2	GROUND
3	NO CONNECTION
4	PLUS 12 VOLTS
5	THERMISTOR, ACTIVE
6	MINUS 24 VOLTS OPTIONAL
7	PLUS 24 VOLTS OPTIONAL
8	THERMISTOR, RETURN TO GROUND
9	MINUS 12 VOLTS

The maximum current from the plus 12 volt supply added to the maximum current from the plus 24 volt supply must be less than 25 MA..

The maximum current from the minus 12 volt supply added to the maximum current from the minus 24 volt supply must be less than 25 MA..

It is recommended to use the SETUP command to insure that the plus and minus 12 volt supplies have not dropped in voltage as an overload might do.

External Display and Plotter Connector Assignments

This connector is located under the side cover on the right side of the unit. Remove the two screws and cover to gain access to the 15 pin female connector. A larger external display requiring X/Y and intensity can be connected or it can drive an X/Y plotter.

PIN #	NAME	ACTIVE LEVEL
1	PLOTTER SEEK	LOW FOR SEEK, +12 FOR IDLE
2	INTENSITY	GND FOR BLANK, +4 FOR LOW, +5 FOR HIGH
3	INTENSITY	+12 for BLANK, +3 FOR LOW, GND FOR HIGH
4	+Y	1 VOLT PEAK TO PEAK
5	-Y	1 VOLT PEAK TO PEAK
6	ANALOG GROUND	
7	-X	1 VOLT PEAK TO PEAK
8	+X	1 VOLT PEAK TO PEAK
9	PLOTTER ENABLE	LOW ENABLED, +12 FOR DO NOT PLOT
10	PLOT COMPLETE	+3 to +12 FOR ADVANCE TO NEXT POINT
11	GROUND	
12	GROUND	
13	GROUND	
14	GROUND	
15	GROUND	

TABLE OF REPLACEMENT PARTS FOR 2056-B

Battery	Yuasa	NP6-12
Cassette Recorder	Braemar-CM600C	600-0028-414
LCD Display	Epson	EA-H20025AR-Y
CRT	AEG	D7-233GY
Keys	EAO	99-451
Key tops	EAO	99-902.9
Power Switch	EAO	51-281.025
Display switch	Grayhill	513374-12-C
Cursor Switch	Switchcraft	29306
Charger Connector	Switchcraft	712A
Charger Cable	Switchcraft	760
Converter (24 Volt)	Power General	PG-413

PRINTED CIRCUIT BOARD ASSEMBLIES

Linear Amplifier "LA"	AR547
ADC "A"	AR503E
ADC Control "2B"	AR623
Display Control "D"	AR507G
Control 'C"	AR511G
MPU : "M"	AR618
High Voltage "2H"	AR580
Main Power Supply	AR548
Key Board Assembly	AR508E
High Voltage Multiplier	AR520E

NOTE: Parts not listed above are identified by standard parts numbers printed on each part. These parts are available from a number of manufacturers and are generally interchangeable.

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DIAGNOSTIC MONITOR

The DIAGNOSTIC MONITOR program is included in the system software of the 2056-4K. The monitor was originally a system development and debugging tool. It has shown to be useful as a helper for testing and servicing.

The monitor is called by sending "DIAG" followed by a carriage return over the RS-232-C port. The system software proccesses this command just as if it were a key label. Once the monitor is called it sends the prompt "NEXT ?" and waits for a single character command as described below:

"M" - MEMORY COMMAND

The MEMORY COMMAND is used to examine and change any memory location that contains RAM. Normally the RAM addresses are from $0000 to $0FFF and from $400E to $403F. After "M" is received the MCA responds by sending "BEG ? nnnn-". Which is the last BEGinning address entered. Enter the new beginning address and push the RETURN key on the terminal (CARRIAGE RETURN). The MCA now sends the next address followed by the first memory content to be examined, enter a new content for that location and push the SPACE bar on the terminal. There are 8 consecutive memory contents per line. Push the RETURN key to end the command.

"W" - WRITE COMMAND

The WRITE COMMAND is used to send data to a location which is write only such as a latch. Normally the hardware addresses are from $4800 to $4FFF. After "W" is received the MCA responds by sending "BEG ? nnnn-". Enter the beginning address and push the RETURN key. The MCA sends the next address, enter the data for this location and push the SPACE bar. There are 4 consecutive memory locations per line. Push the RETURN key to end the command.

"P" - PRINT COMMAND

The PRINT COMMAND is used to examine a section of memory in EPROM. Normally the system EPROM addresses are from $8000 to $FFFF and the USER addresses from $1000 to $3FFF and $5000 to $7FFF. After "P" is received the MCA responds by sending "BEG ? nnnn-" which is the BEGinning address. Enter a new beginning address and push the SPACE bar. The MCA responds by sending "END ? nnnn-" which is the ENDing address. Enter a new ending address and push the RETURN key. The MCA sends the next address followed by the next 16 locations in hexadecimal and the ASCII representation.

"J" - JUMP COMMAND

The JUMP COMMAND is used to execute a subroutine. After "J" is received the MCA responds by sending "ADD ? nnnn-". Which is the ADDress of the subroutine. Enter a new address and push the RETURN key. The MCA sends "*" before it makes the jump to the subroutine.

"A" - ADC MEMORY COMMAND

The ADC MEMORY COMMAND is used to examine and change the ADC memory. The ADC memory is a block of ram 16K by 8 bits and is separate from the MPU address. The address for the ADC memory is entered into a counter and then sequentially accessed. After "A" is received the MCA responds by sending "BEG ? nnnn-". Which is the beginning channel in hexadecimal. Enter a new beginning channel and push the RETURN key. The MCA responds with the channel number and the contents. The first two characters are used in the generation of the CRT display to flag the cursor and ROIs. The last six characters represent the 24 bit data in hexadecimal. Enter a new channel content and push the SPACE bar. Push the RETURN key to end the command.

"C" - CHECKSUM COMMAND

The CHECKSUM COMMAND is used to generate a number for a section of memory wich can then be compared with other MCAs to see if the code in memory is the same. After "C" is received the MCA responds by sending "BEG ? nnnn-" which is the BEGinning address. Enter a new beginning address and push the SPACE bar. The MCA responds by sending "END ? nnnn-" which is the ENDing address. Enter a new ending address and push the RETURN key. The MCA responds by sending a four character checksum.

"T" - TEST ADC MEMORY COMMAND

The TEST ADC MEMORY COMMAND is used to test the ADC memory. After "T" is received the MCA responds by sending "MEMORY TEST" and displaying on the LCD "MEMORY TEST ACTIVE". A ramp is generated in the ADC memory and then incremented. This test is used mainly to check the B board interface and CRT display. Push any key on the terminal to end the command.

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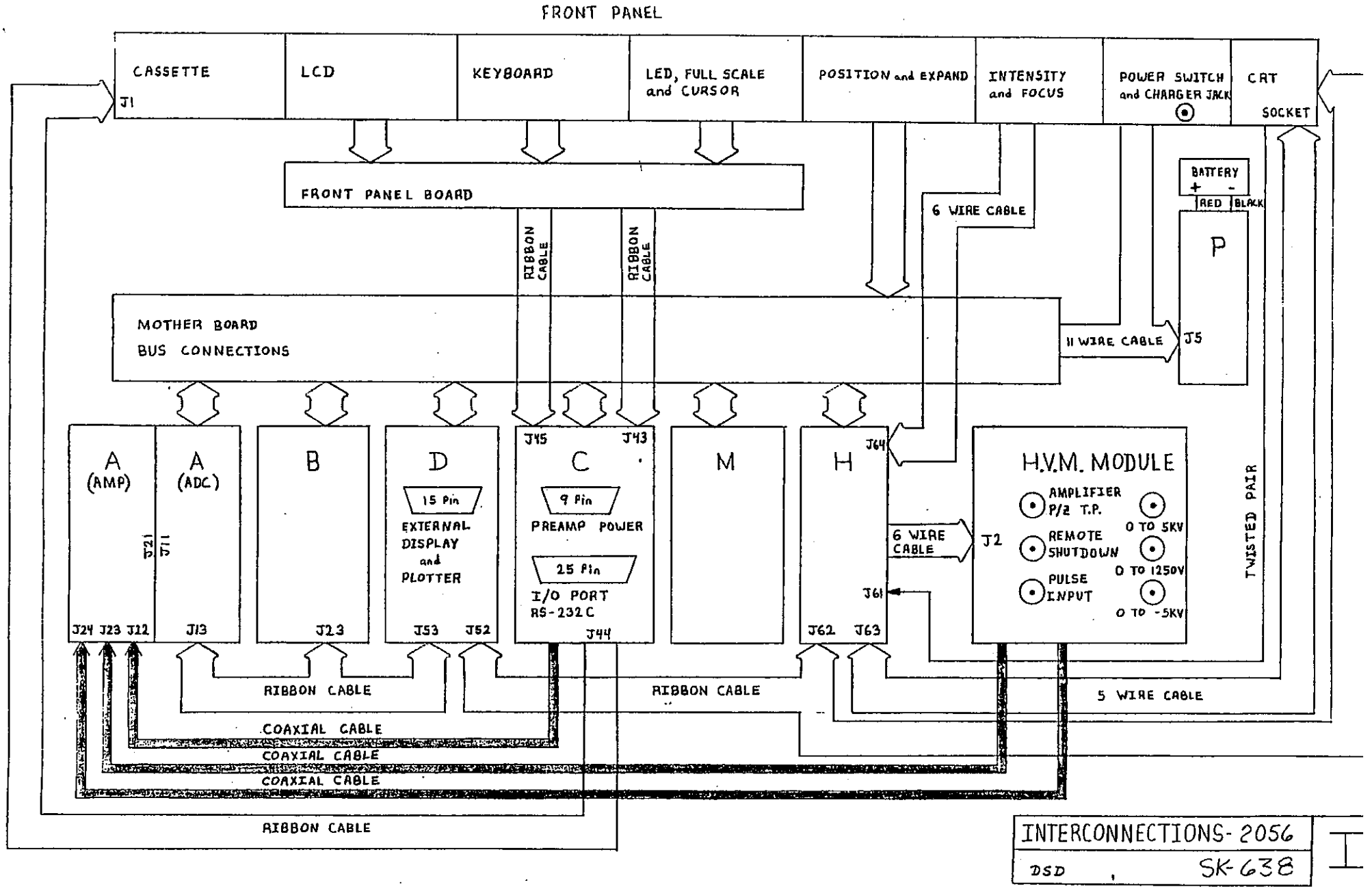
DIAGNOSTIC MONITOR USING THE IBM XT COMPUTER

```
10 CLOSE 1:OPEN "COM1:9600,E,7,,CS,DS,CD" AS #1
20 WIDTH 80:SCREEN 0:CLS
30 PRINT "DIAGNOSTIC MONITOR FOR THE 2056-4K MCA"
40 PRINT
50 PRINT "*****      WARNING      *****"
60 PRINT
70 PRINT "DISCONNECT DETECTOR FROM THE MCA"
80 PRINT "REMOVE TAPE FROM RECORDER"
90 PRINT
100 PRINT "Set the MCA for 9600 BAUD and EVEN PARITY.
110 PRINT "Minimum cable connections for MCA are:"
120 PRINT "Pin 2 - input to MCA / Pin 3 - output from MCA / Pin 7 - Ground
130 PRINT "Consult manuals for IBM for proper cable connections to COM1"
140 PRINT
150 PRINT "The following commands are valid:"
160 PRINT
170 PRINT "P-Print the memory contents between BEG and END."
180 PRINT "M-Modify memory starting at BEG."
190 PRINT "W-Write to memory starting at BEG."
200 PRINT "A-ADC memory starting at BEG."
210 PRINT "C-Check sum of memory between BEG and END."
220 PRINT "J-Jump to subroutine at ADD. (Must push Return)"
230 PRINT "E-Exit monitor.
240 PRINT
250 BEEP
260 PRINT#1,"DIAG"
270 PRINT#1,CHR$(19);
280 IF LOF(1)=256 THEN 320
290 A$=INPUT$(1,#1)
300 IF ASC(A$)<>10 THEN PRINT A$;
310 GOTO 280
320 A$=INKEY$:IF A$="" THEN 350
330 IF A$> " " THEN PRINT A$;
340 IF A$<>"S" THEN PRINT#1,A$;
350 PRINT#1,CHR$(17);
360 GOTO 270
```

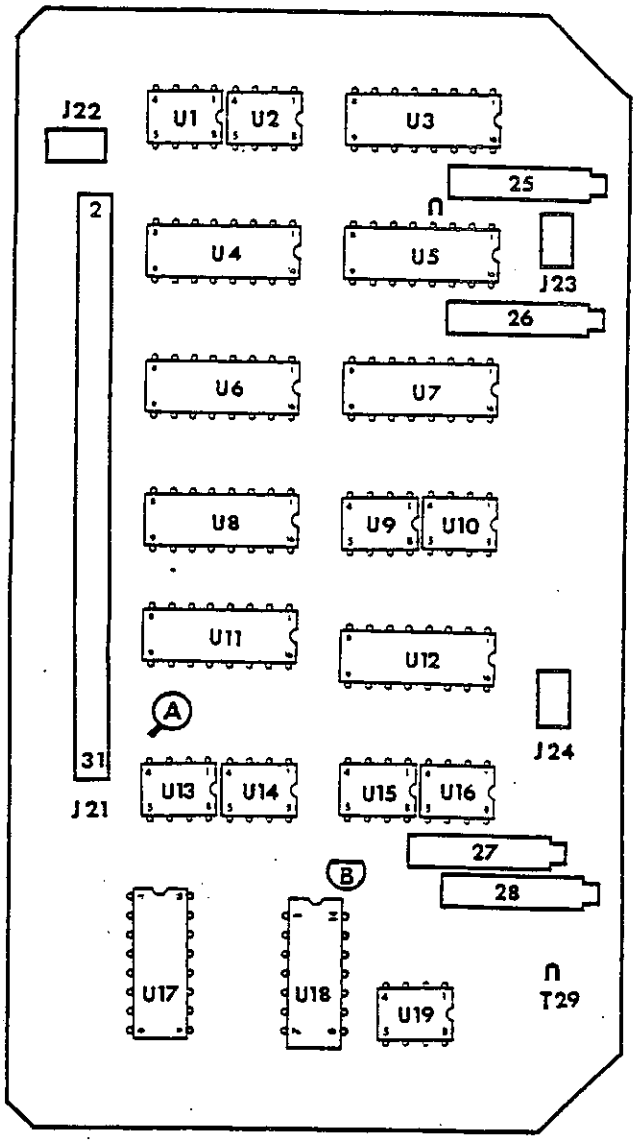


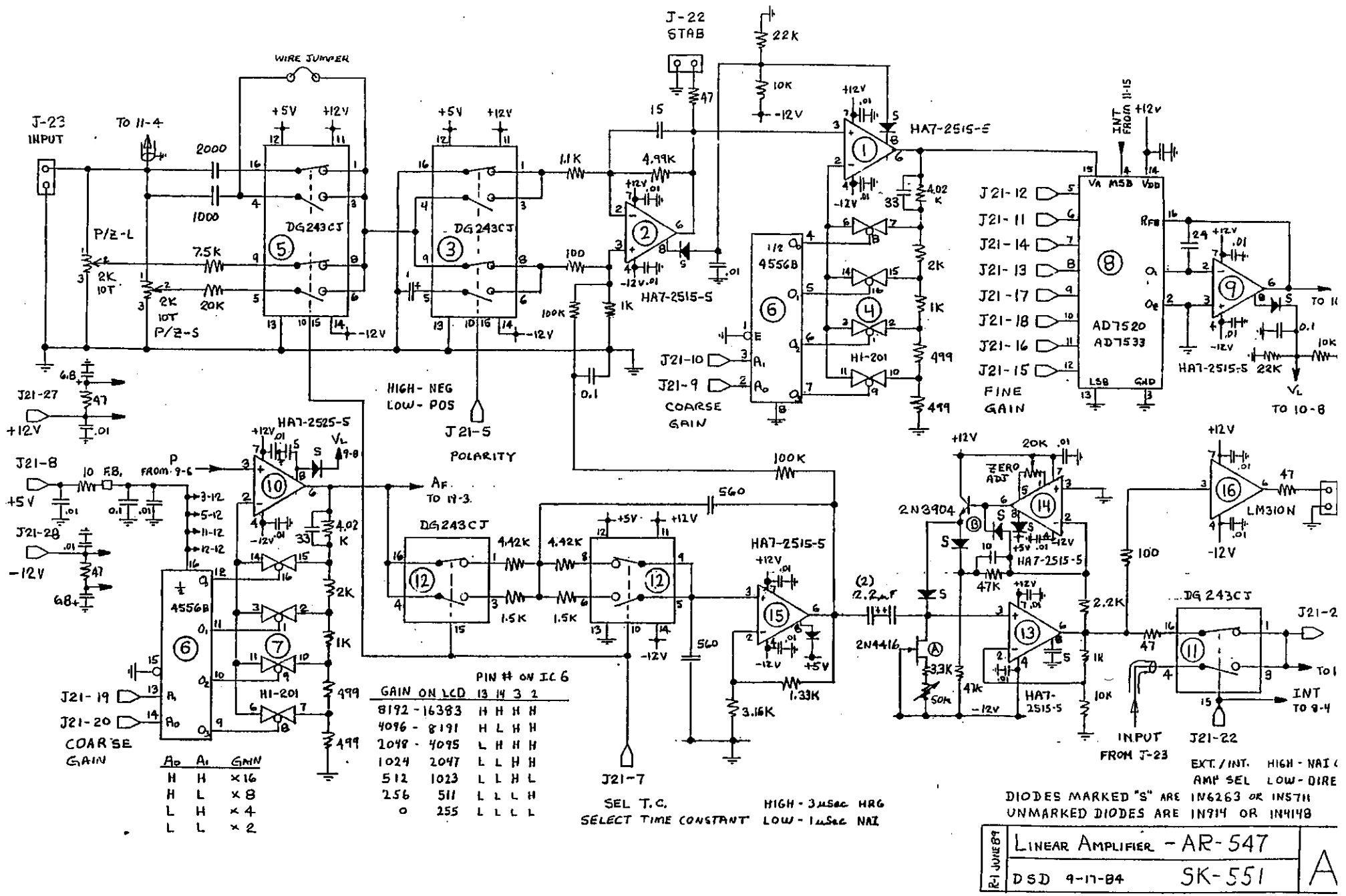
INTERCONNECTIONS- 2056

DSD SK-638

"LA" LINEAR AMPLIFLIER, PC BOARD AR547

LOCATION	PART #	MANUFACTURER
U1	HA7-2515-5	HARRIS
U2	HA7-2515-5	HARRIS
U3	DG5043CJ	SILICONIX
U4	HI1-0201-5	HARRIS
U5	DG5043CJ	SILICONIX
U6	MC14556BCP	MOTOROLA
U7	HI1-0201-5	HARRIS
U8	AD7533JN	ANALOG DEV.
U9	HA7-2515-5	HARRIS
U10	HA7-2525-5	HARRIS
U11	DG5043CJ	SILICONIX
U12	DG5043CJ	SILICONIX
U13	HA7-2515-5	HARRIS
U14	HA7-2515-5	HARRIS
U15	HA7-2515-5	HARRIS
U16	LM310N	NATIONAL
U17	MC74HC4538N	MOTOROLA
U18	TC40H074P	TOSHIBA
U19	TL810CP	TEXAS INST.
20		
J21	22-03-2151	MOLEX
J22	22-05-3021	MOLEX
J23	22-23-2021	MOLEX
J24	22-23-2021	MOLEX
25	3006-1-202	BOURNS
26	3006-1-202	BOURNS
27	3006-1-203	BOURNS
28	3006-1-503	BOURNS
T29	TEST POINT	
TRANSISTORS		
A	2N4416	MOTOROLA
B	2N3904	MOTOROLA



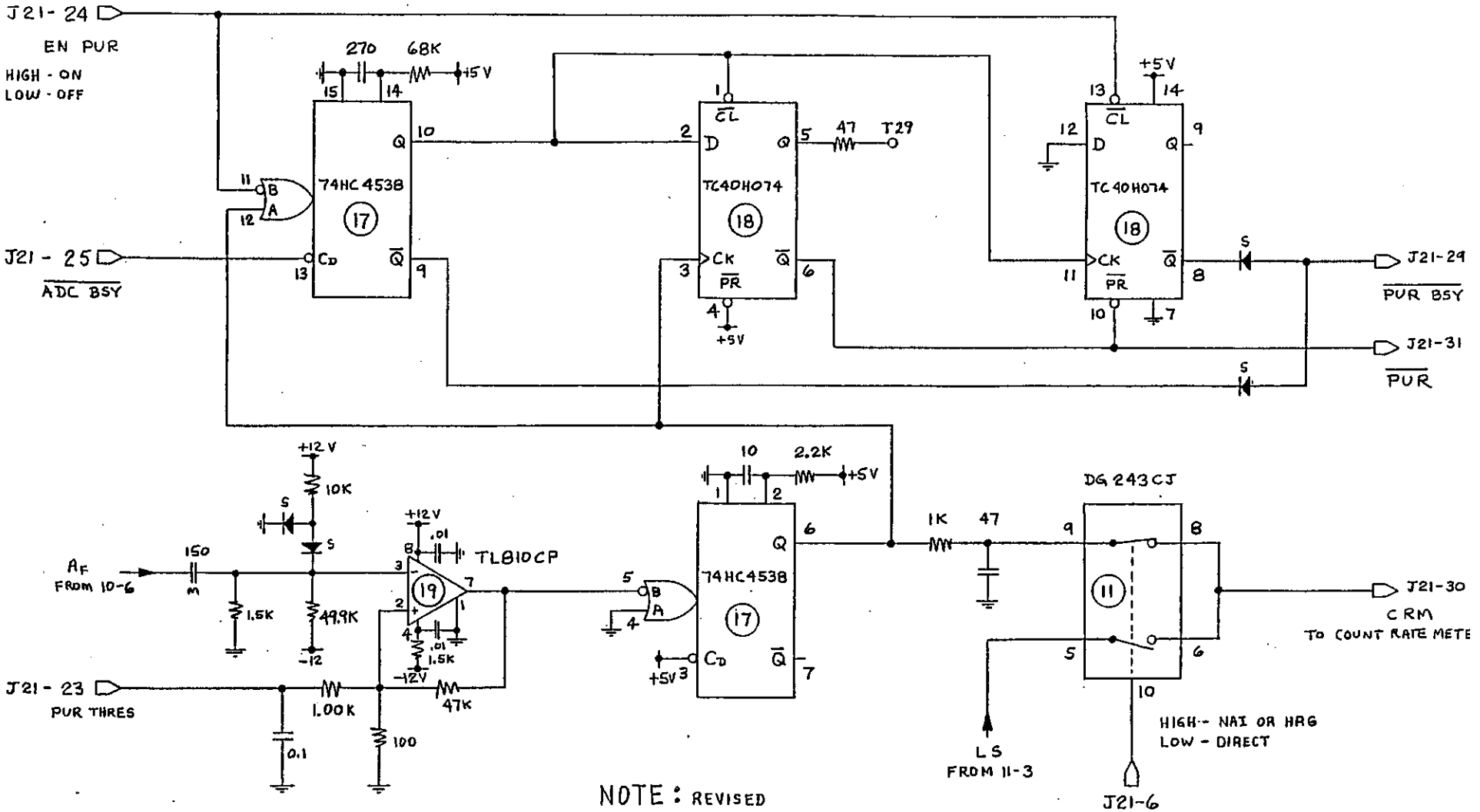


A_0	A_1	GAIN
H	H	×16
H	L	×8
L	H	×4
L	L	×2

GAIN ON LCD	PIN # ON IC 6 13	14	3	2
8192 - 16383	H	H	H	H
4096 - 8191	H	L	H	H
2048 - 4095	L	H	H	H
1024 - 2047	L	L	H	H
512 - 1023	L	L	H	L
256 - 511	L	L	L	H
0 - 255	L	L	L	L

DIODES MARKED "S" ARE IN6263 OR IN5711
UNMARKED DIODES ARE IN914 OR IN4148

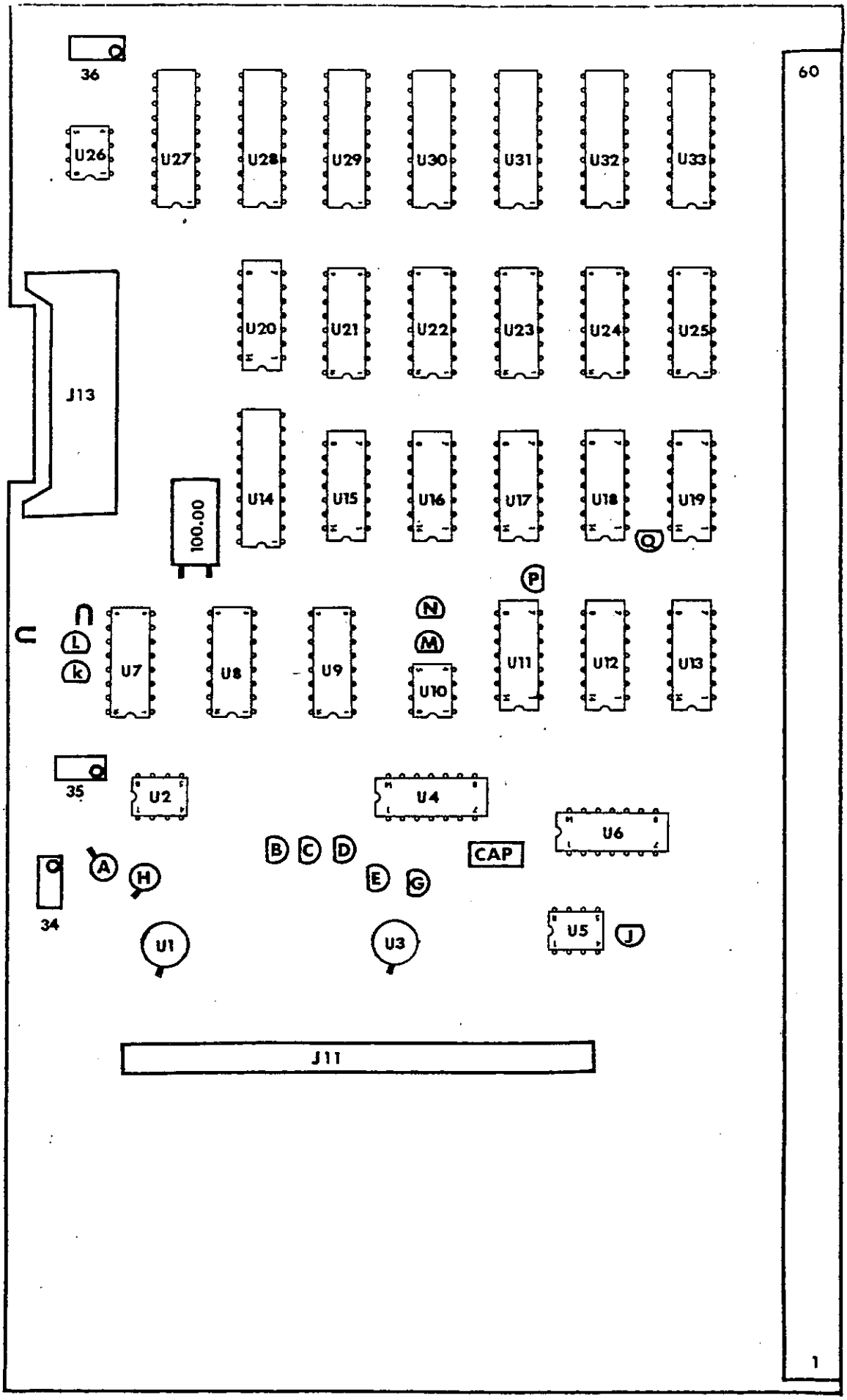
R-1 JUNE 89	LINEAR AMPLIFIER - AR-547	A
	DSD 9-17-84 SK-551	



NOTE: REVISED
Circuit for Amplifier board
marked AR-547

DIODES MARKED "S" ARE IN6263 OR IN5711

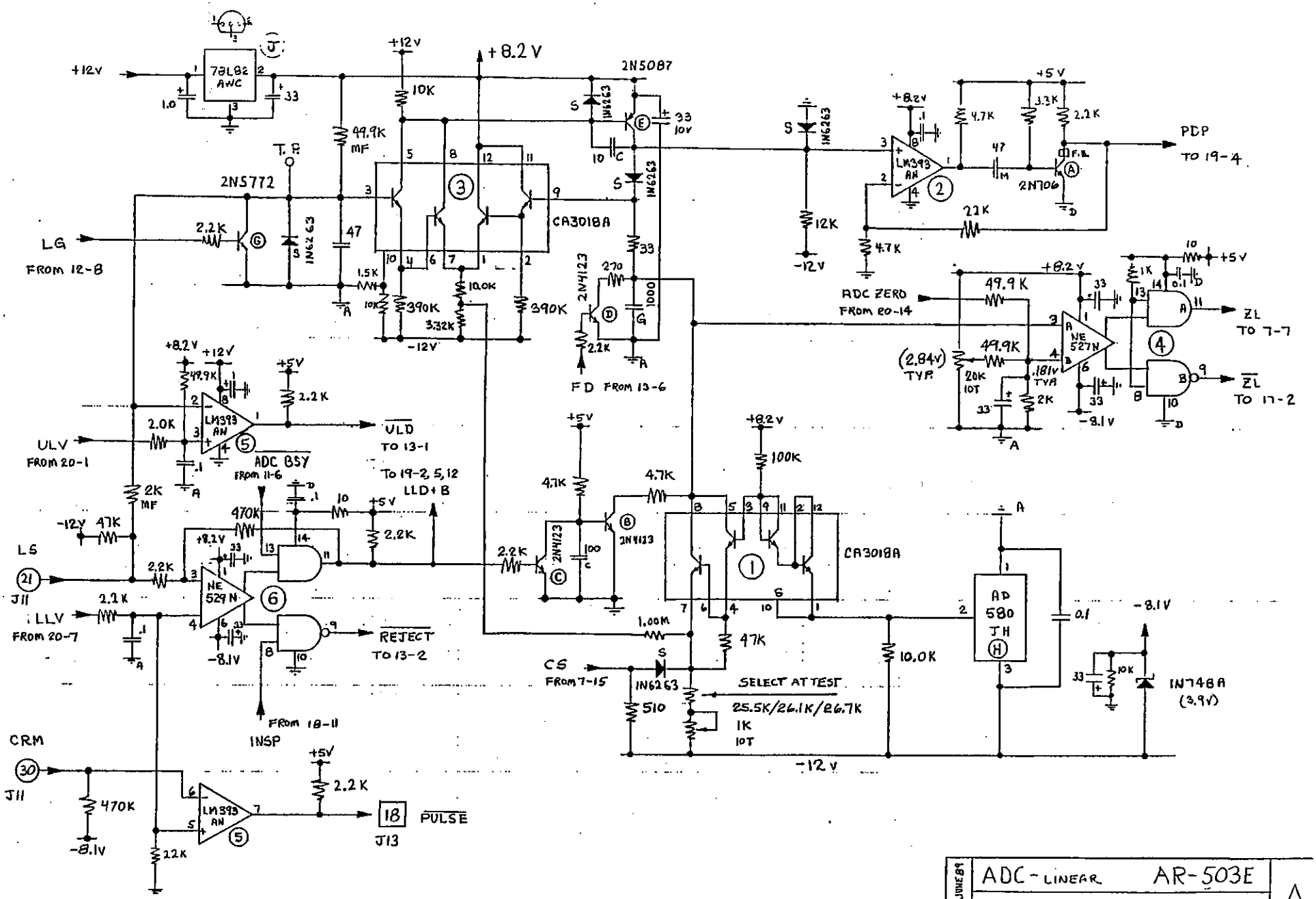
PILE UP REJECTOR - AR-547	A
DSD 9-17-84 SK-552	



"A" ADC PC BOARD AR503E

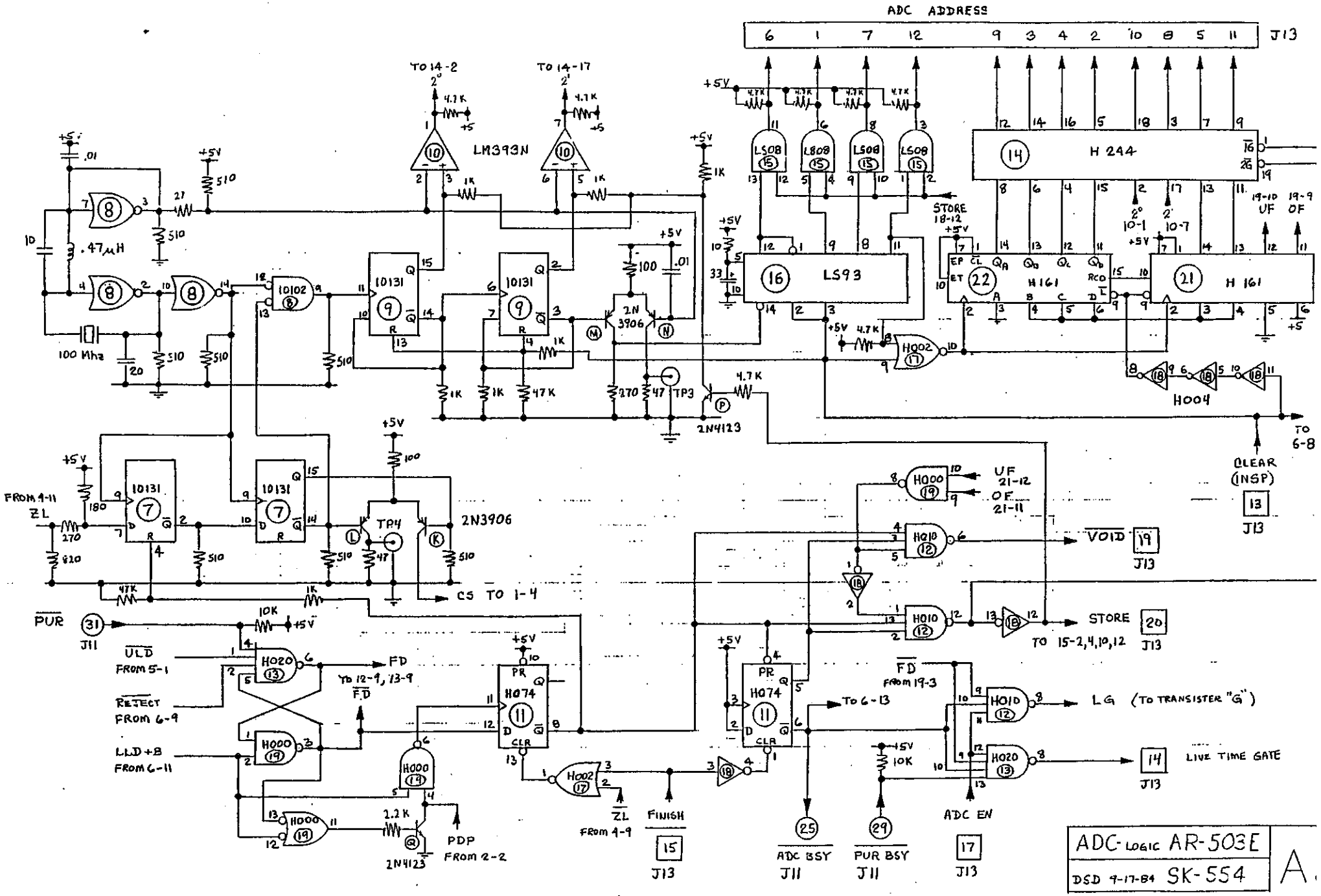
"A" ADC PC BOARD AR503E

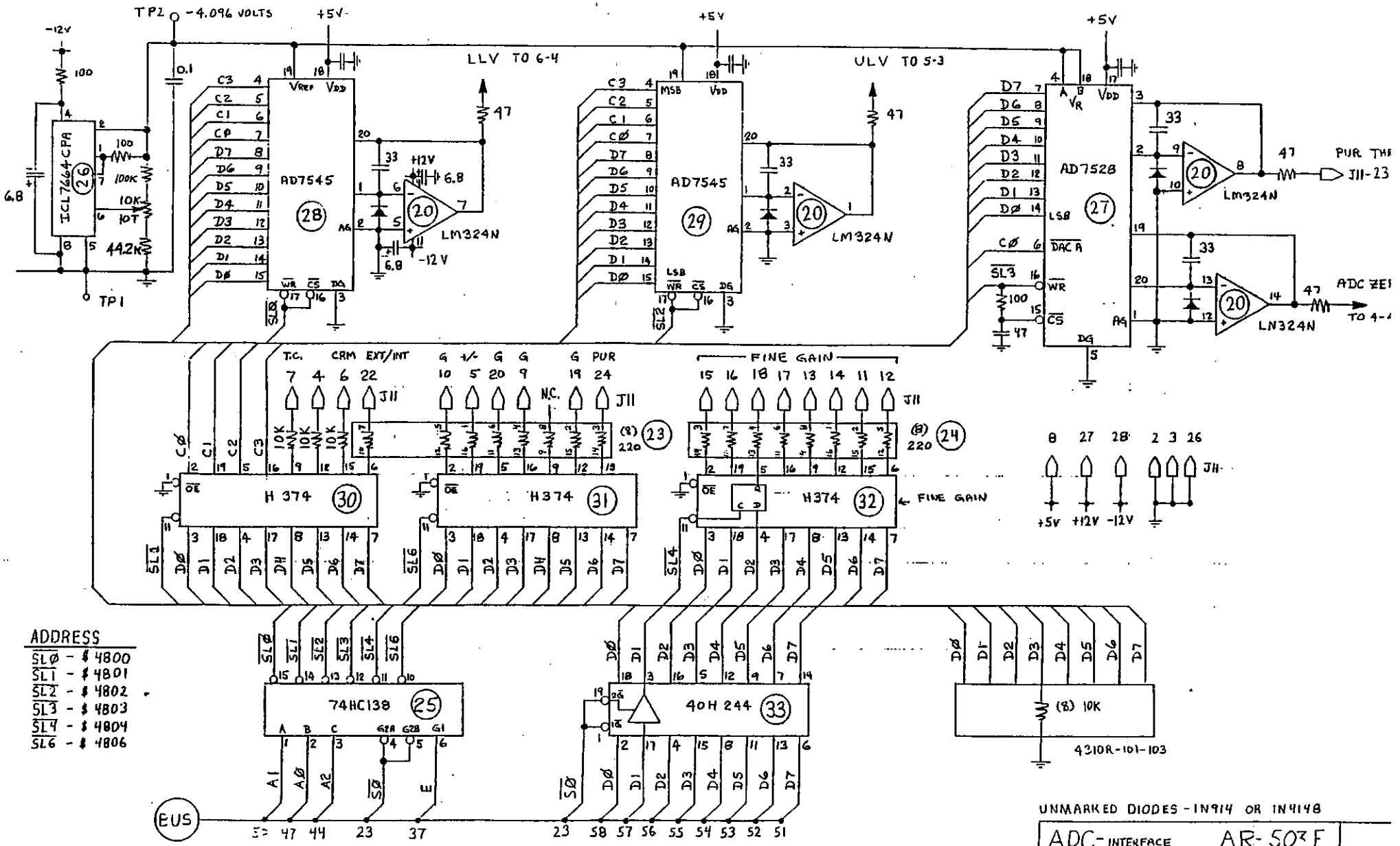
LOCATION	PART #	MANUFACTURER
U1	CA3018A	RCA
U2	LM393AN	NATIONAL
U3	CA3018A	RCA
U4	NE527N	SIGNETICS
U5	LM393AN	NATIONAL
U6	NE529N	SIGNETICS
U7	MC10131P	MOTOROLA
U8	MC10102P	MOTOROLA
U9	MC10131P	MOTOROLA
U10	LM393AN	NATIONAL
U11	TC40H074P	TOSHIBA
U12	TC40H010P	TOSHIBA
U13	TC40H020P	TOSHIBA
U14	MC74HC244	MOTOROLA
U15	SN74LS93N	TEXAS INST.
U16	SN74LS93N	TEXAS INST.
U17	TC40H002P	TOSHIBA
U18	TC40H004P	TOSHIBA
U19	TC40H000P	TOSHIBA
U20	LM324N	MOTOROLA
U21	TC40H161P	TOSHIBA
U22	TC40H161P	TOSHIBA
U23	16-1-221	
U24	16-1-221	
U25	MC74HC138	MOTOROLA
U26	ICL7664BCJA	INTERSIL
U27	AD7528KN	ANALOG DEV.
U28	AD7545KN	ANALOG DEV.
U29	AD7545KN	ANALOG DEV.
U30	TC40H374P	TOSHIBA
U31	TC40H374P	TOSHIBA
U32	TC40H374P	TOSHIBA
U33	MC74HC244	MOTOROLA
34	3299W-1-102	BOURNS
35	3299W-1-203	BOURNS
36	3299W-1-103	BOURNS
J11	22-02-2165	MOLEX
J13	3428-1002	3M
H	AD580JH	ANALOG DEV.
J	UA78L82AWC	FAIRCHILD
TRANSISTORS		
A	2N706	MOTOROLA
B,C,D,P,Q	2N4123	MOTOROLA
E	2N5087	MOTOROLA
G	2N5772	MOTOROLA
K,L,M,N	2N3906	MOTOROLA



R-1 JUNE 89	ADC - LINEAR	AR-503E
	DSD 9-17-84	SK-553

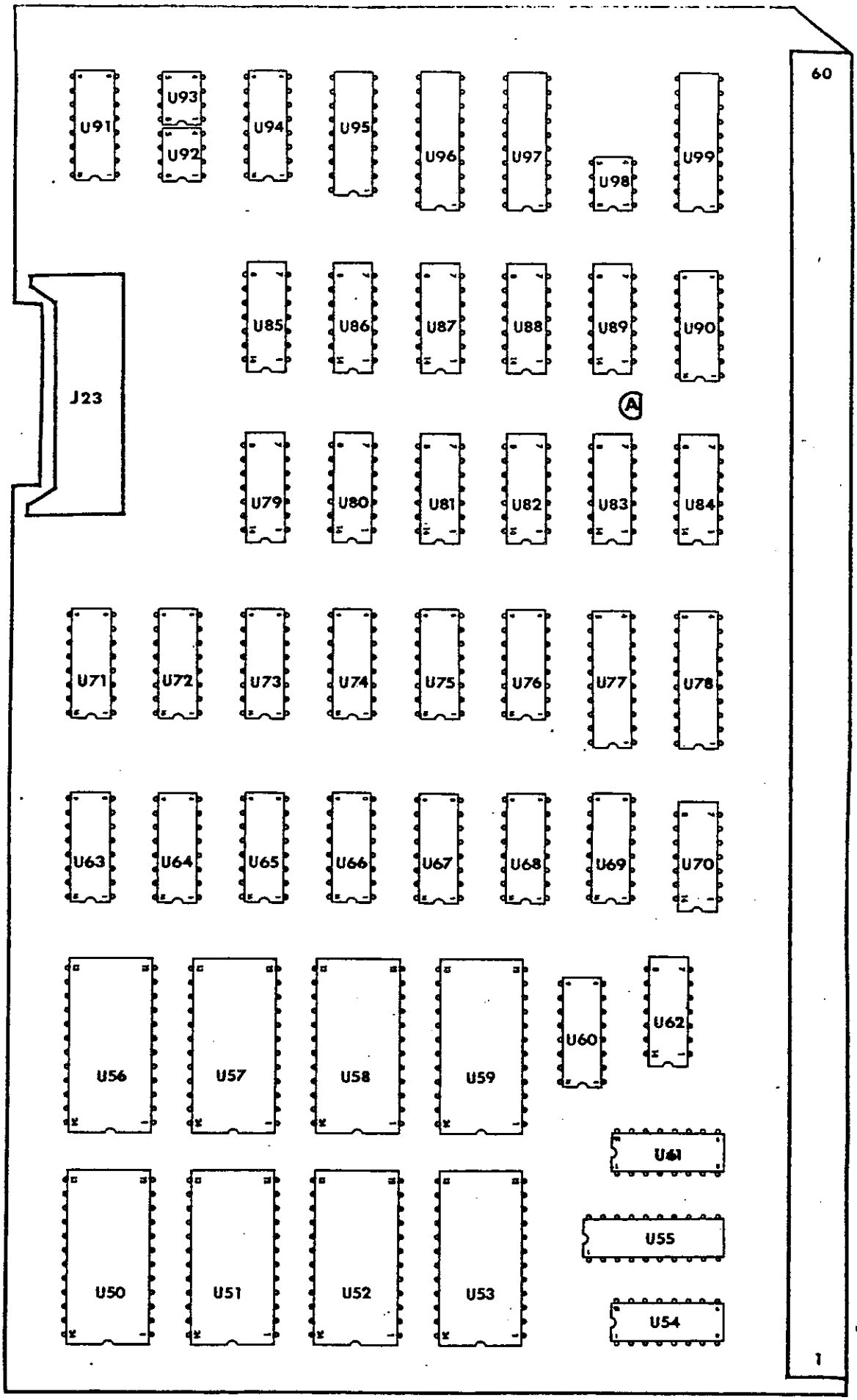
A


ADC ADDRESS
6 1 7 12 9 3 4 2 10 8 5 11
J13
TO 14-2
TO 14-17
LM393N
+5V
.01
.47μH
100 MHz
510
1K
4.7K
47K
270
47
100
10102
10131
2N3906
2N4123
TP3
TP4
LS08
H 244
LS93
H 161
H004
H000
H002
H010
H020
H074
STORE 18-12
TO 6-8
CLEAR (INSP)
UF 21-12
OF 21-11
VOID
STORE
TO 15-2,4,10,12
FROM 4-11 ZL
CS TO 1-4
PUR
ULD
FROM 5-1
REJECT
FROM 6-9
LLD+8
FROM 6-11
FD
TO 12-9, 13-9
PDP
FROM 2-2
2.2K
ZL
FROM 4-9
FINISH
TO 6-13
FD
FROM 19-3
LG (TO TRANSISTER "G")
LIVE TIME GATE
ADC EN
ADC BSY
PUR BSY
ADC-LOGIC AR-503E
DSD 9-17-84 SK-554
A



ADC-INTERFACE	AR-503E
DSD 9-17-84	SK-555

A4

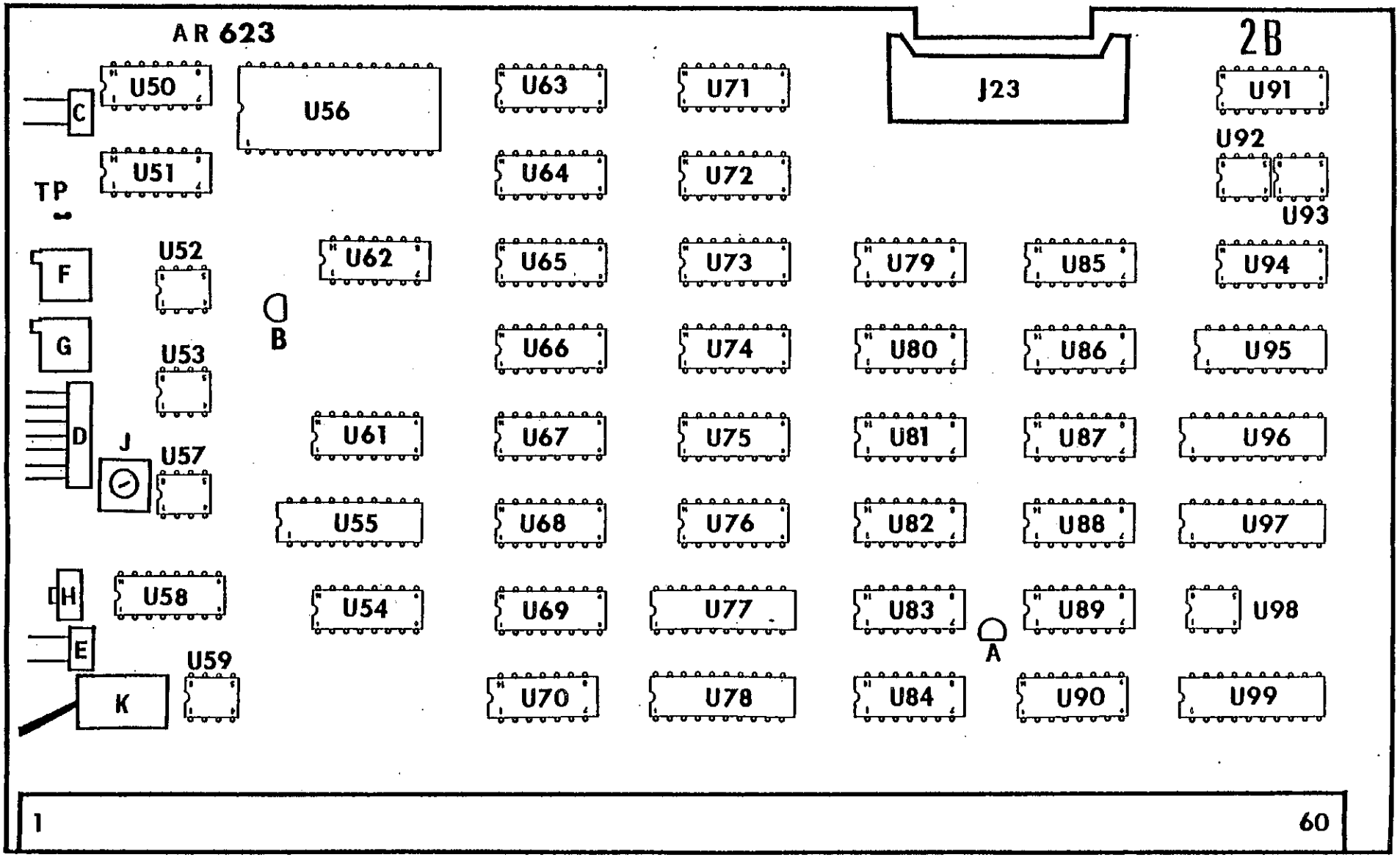


"B" ADC MEMORY PC BOARD AR506E

"B" ADC MEMORY PC BOARD AR506E

LOCATION	PART #	MANUFACTURER
U50	TC5517APL	TOSHIBA
U51	TC5517APL	TOSHIBA
U52	TC5517APL	TOSHIBA
U53	TC5517APL	TOSHIBA
U54	TC40H193P	TOSHIBA
U55	MC74HC244	MOTOROLA
U56	TC5517APL	TOSHIBA
U57	TC5517APL	TOSHIBA
U58	TC5517APL	TOSHIBA
U59	TC5517APL	TOSHIBA
U60	MC74HC138	MOTOROLA
U61	TC40H193P	TOSHIBA
U62	MC74HC00	MOTOROLA
U63	TC40H157P	TOSHIBA
U64	TC40H157P	TOSHIBA
U65	TC40H157P	TOHHIBA
U66	TC40H157P	TOSHIBA
U67	TC40H193P	TOSHIBA
U68	TC40H193P	TOSHIBA
U69	TC40H193P	TOSHIBA
U70	MC74HC74	MOTOROLA
U71	TC40H153P	TOSHIBA
U72	TC40H153P	TOSHIBA
U73	TC40H153P	TOSHIBA
U74	TC40H153P	TOSHIBA
U75	TC40H153P	TOSHIBA
U76	TC40H153P	TOSHIBA
U77	MC74HC374	MOTOROLA
U78	TC40H245P	TOSHIBA
U79	TC40H004P	TOSHIBA
U80	TC40H010P	TOSHIBA
U81	MC74HC74	MOTOROLA
U82	MC74HC74	MOTOROLA
U83	TC40H010P	TOSHIBA
U84	MC74HC74	MOTOROLA
U85	MC74HC74	MOTOROLA
U86	MC74HC74	MOTOROLA
U87	MC74HC74	MOTOROLA
U88	MC74HC00	MOTOROLA
U89	TC40H004P	TOSHIBA
U90	MC74HC138	MOTOROLA
U91	TC40H192P	TOSHIBA
U92	RDD104	LSI
U93	RDD104	LSI
U94	TC40H192P	TOSHIBA
U95	LS7060	LSI
U96	MC74HC244	MOTOROLA
U97	MC74HC374	MOTOROLA
U98	RDD104	LSI
U99	TC40H245P	TOSHIBA
A	2N4123	MOTOROLA
J23	3428-1002	3M

"2B" ADC MEMORY AND OPTIONAL SCA PC BOARD AR623

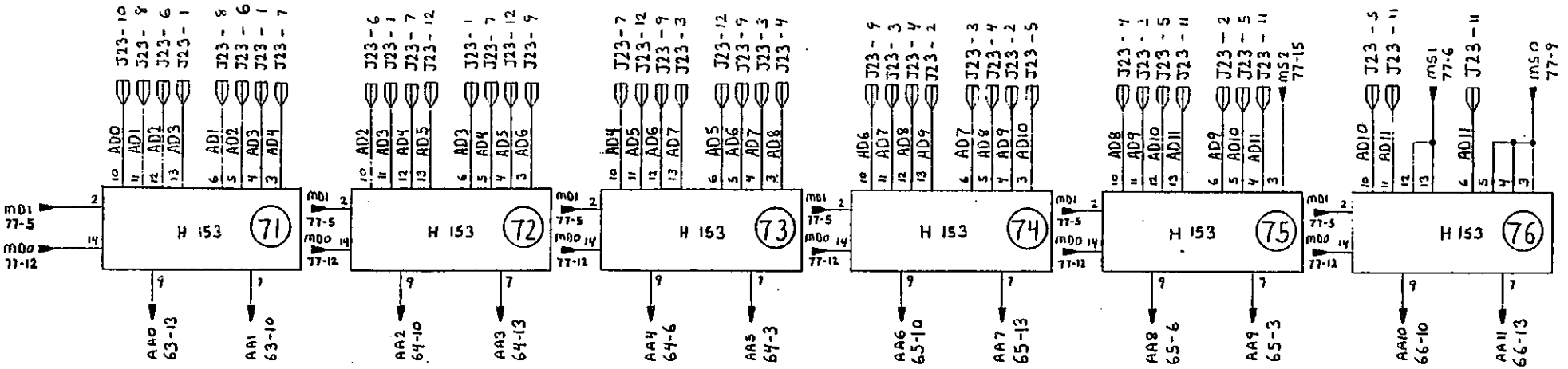


"2B" ADC MEMORY PC BOARD AR623

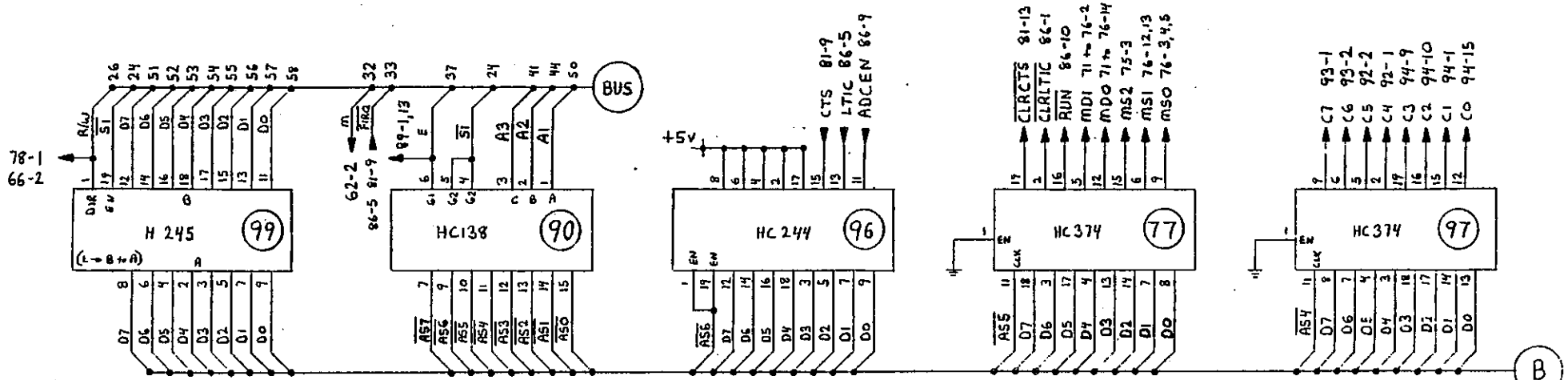
LOCATION	PART #	MANUFACTURER
U50	TC74HC132P	TOSHIBA
U51	TC74HC74P	TOSHIBA
U52	TL810CP	TI
U53	TL810CP	TI
U54	TC40H193P	TOSHIBA
U55	MC74HC244	MOTOROLA
U56	D43256C-12L	NEC
U57	HA7 2515-5	HARRIS
U58	DG243CJ	SILICONIX
U59	LM310N	NATIONAL
U60		
U61	TC40H193P	TOSHIBA
U62	MC74HC00	MOTOROLA
U63	TC40H157P	TOSHIBA
U64	TC40H157P	TOSHIBA
U65	TC40H157P	TOHHIBA
U66	TC40H157P	TOSHIBA
U67	TC40H193P	TOSHIBA
U68	TC40H193P	TOSHIBA
U69	TC40H193P	TOSHIBA
U70	MC74HC74	MOTOROLA
U71	TC40H153P	TOSHIBA
U72	TC40H153P	TOSHIBA
U73	TC40H153P	TOSHIBA
U74	TC40H153P	TOSHIBA
U75	TC40H153P	TOSHIBA
U76	TC40H153P	TOSHIBA
U77	MC74HC374	MOTOROLA
U78	TC40H245P	TOSHIBA
U79	TC40H004P	TOSHIBA
U80	TC40H010P	TOSHIBA
U81	MC74HC74	MOTOROLA
U82	MC74HC74	MOTOROLA
U83	TC40H010P	TOSHIBA
U84	MC74HC74	MOTOROLA
U85	MC74HC74	MOTOROLA
U86	MC74HC74	MOTOROLA
U87	MC74HC74	MOTOROLA
U88	MC74HC00	MOTOROLA
U89	TC40H004P	TOSHIBA
U90	MC74HC138	MOTOROLA
U91	TC40H192P	TOSHIBA
U92	RDD104	LSI
U93	RDD104	LSI
U94	TC40H192P	TOSHIBA
U95	LS7060	LSI
U96	MC74HC244	MOTOROLA
U97	MC74HC374	MOTOROLA
U98	RDD104	LSI
U99	TC40H245P	TOSHIBA

LOCATION	PART #	MANUFACTURER
TRANSISTORS		
A	2N4123	MOTOROLA
B	VN2222L	INTERSIL
CONNECTORS		
J23	3428-1002	3M
C	22-05-3021	MOLEX
D	22-05-3071	MOLEX
E	22-05-3021	MOLEX
POTS		
F	68WR200K	BECKMAN
G	68WR200K	BECKMAN
J	63P203	SPECTROL
H	3386W-1-501	BOURNS
SWITCH		
K	T8206	C-K

MEMORY DIVISION AND SELECTION OF THE ADC ADDRESS



12 BIT MEMORY ADDRESS

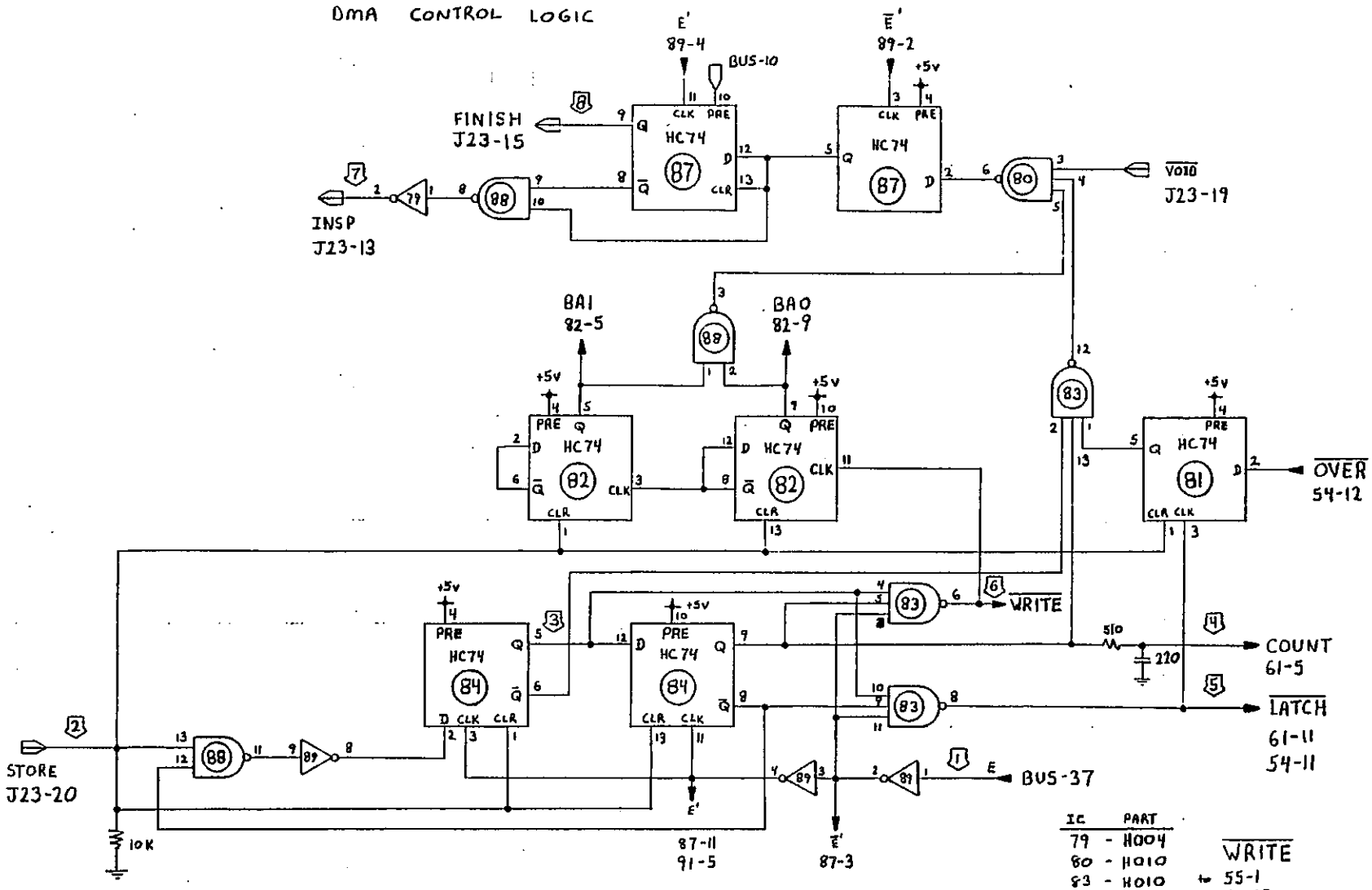


ADDRESS	
$\overline{AS7}$	- #490E
$\overline{AS6}$	- #490C
$\overline{AS5}$	- #490A
$\overline{AS4}$	- #4908
$\overline{AS3}$	- #4906
$\overline{AS2}$	- #4904
$\overline{AS1}$	- #4902
$\overline{AS0}$	- #4900

ADC CONTROL	AR-506E
DSD 9-17-84	SK-556

B1

DMA CONTROL LOGIC

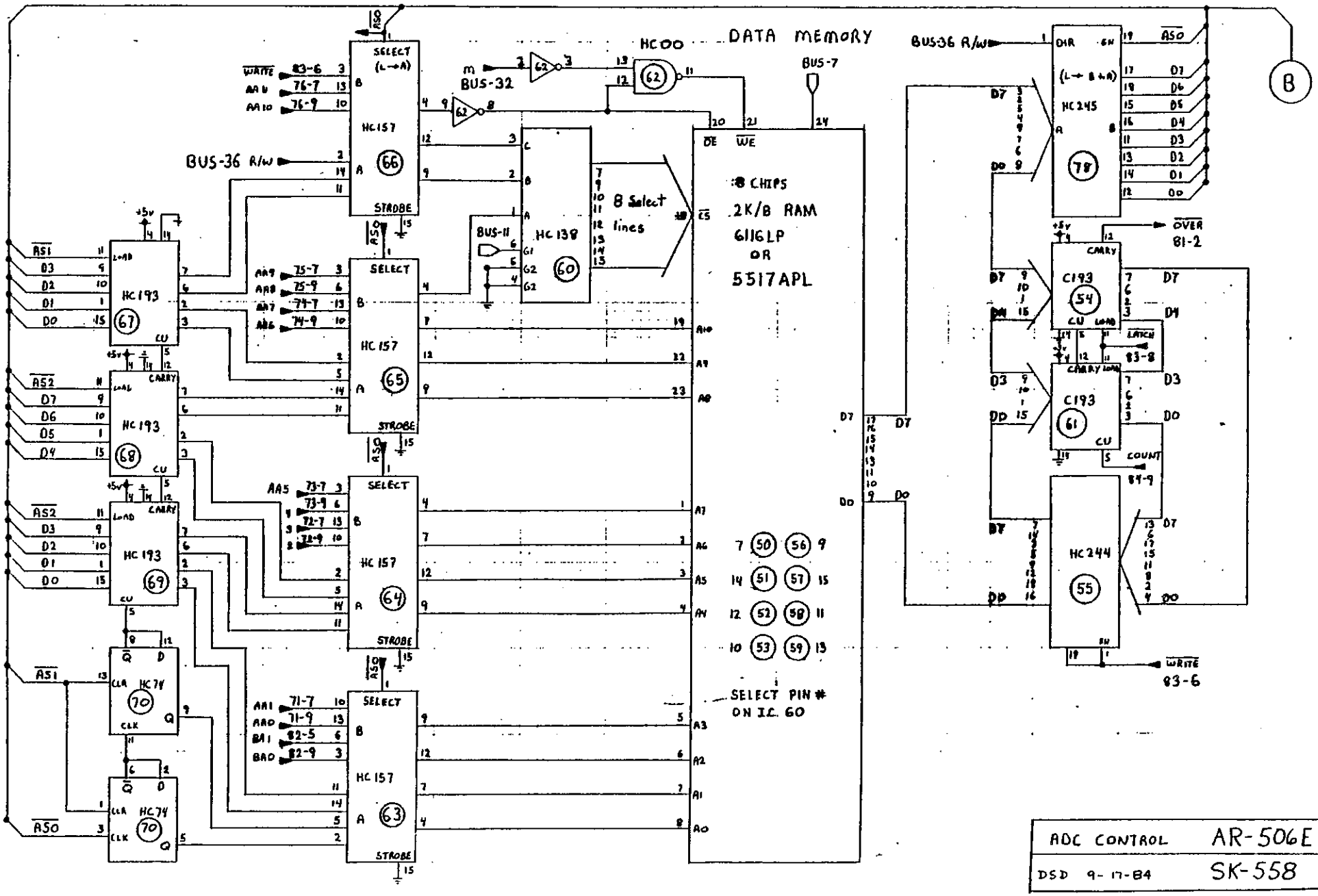


IC	PART
79	- H004
80	- H010
83	- H010
88	- HC00
89	- H004

$\overline{\text{WRITE}}$ to 55-1, 55-19, 66-3

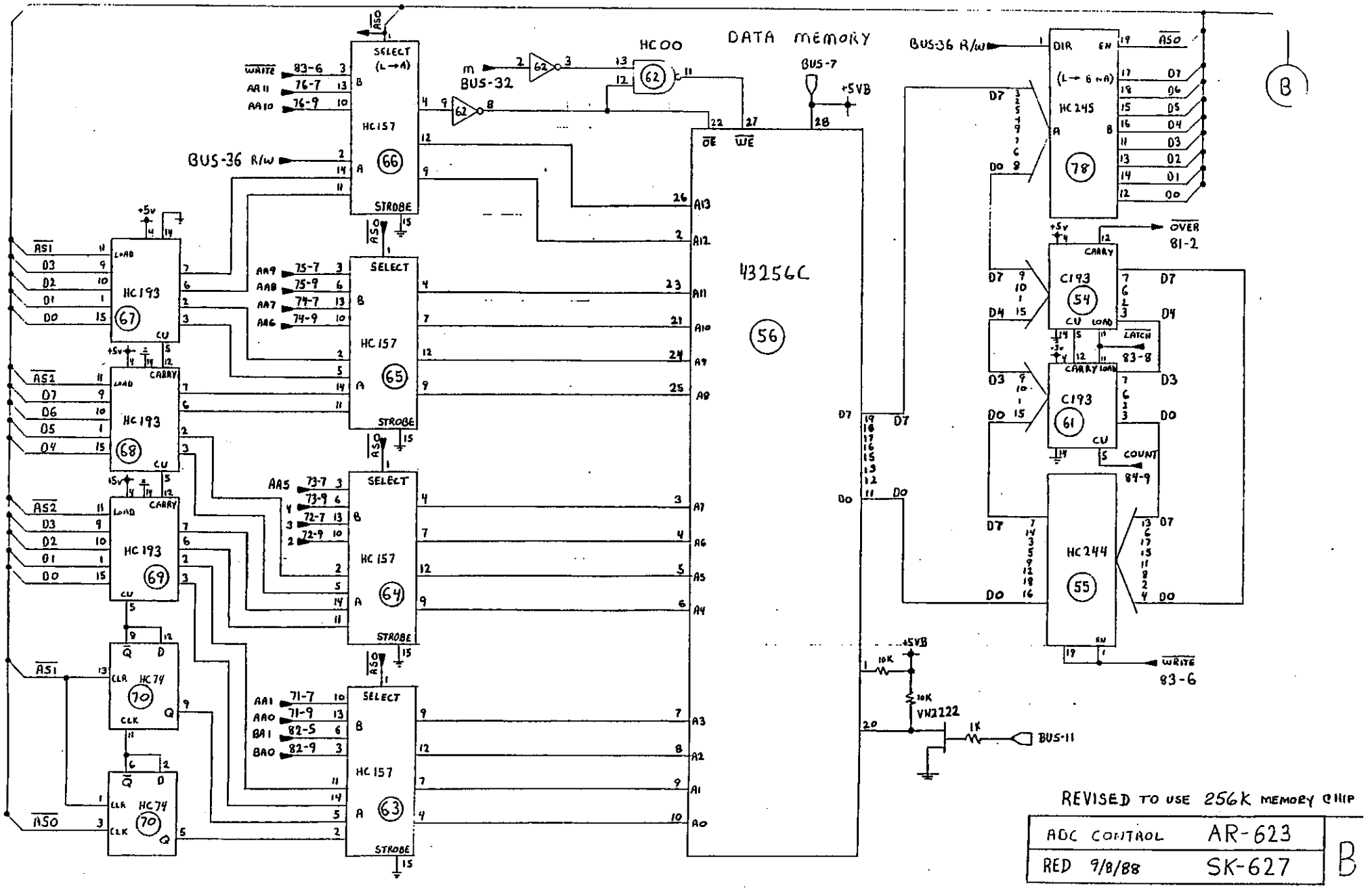
ADC CONTROL	AR-506E
DSD 9-17-84	SK-557

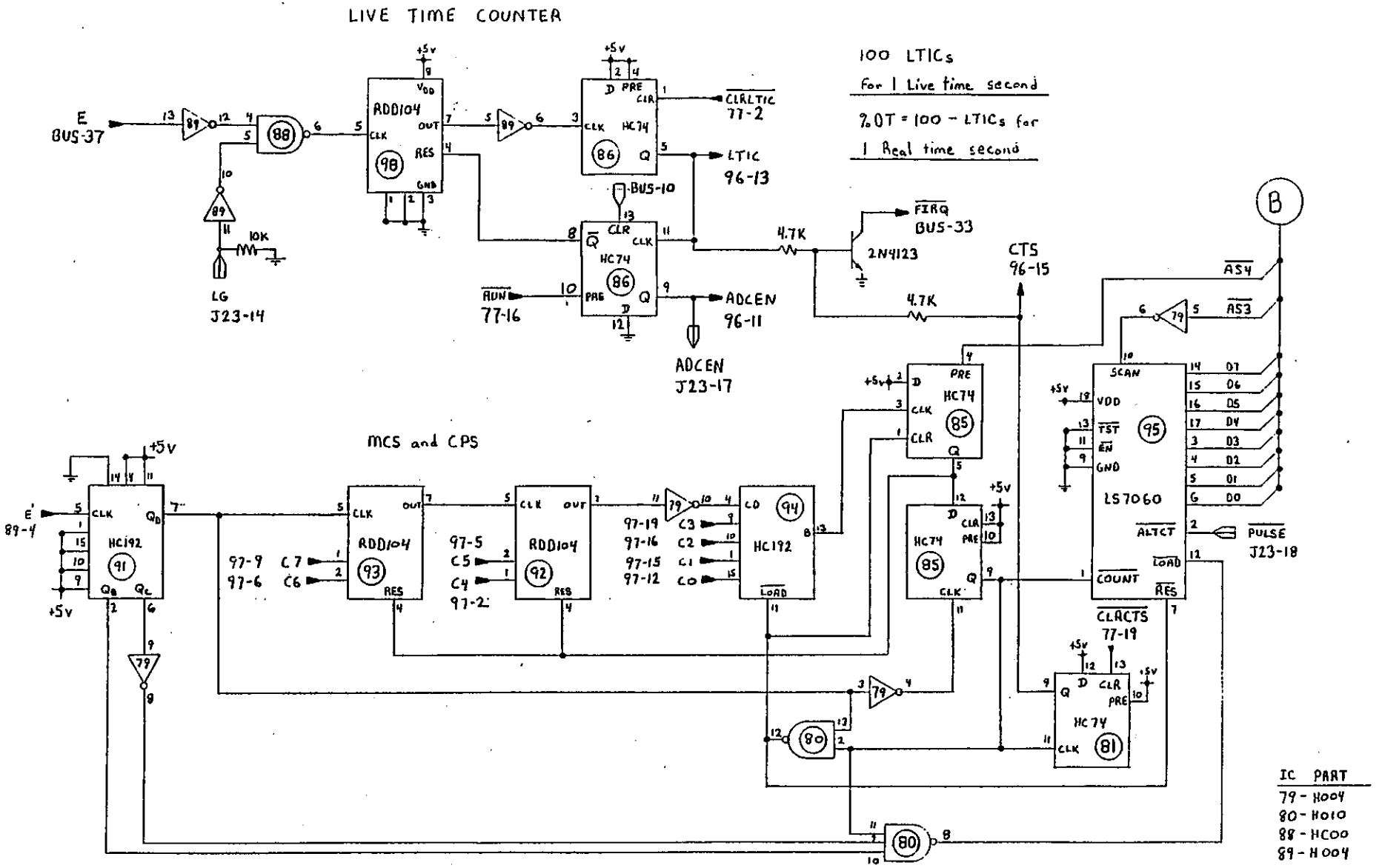
B2

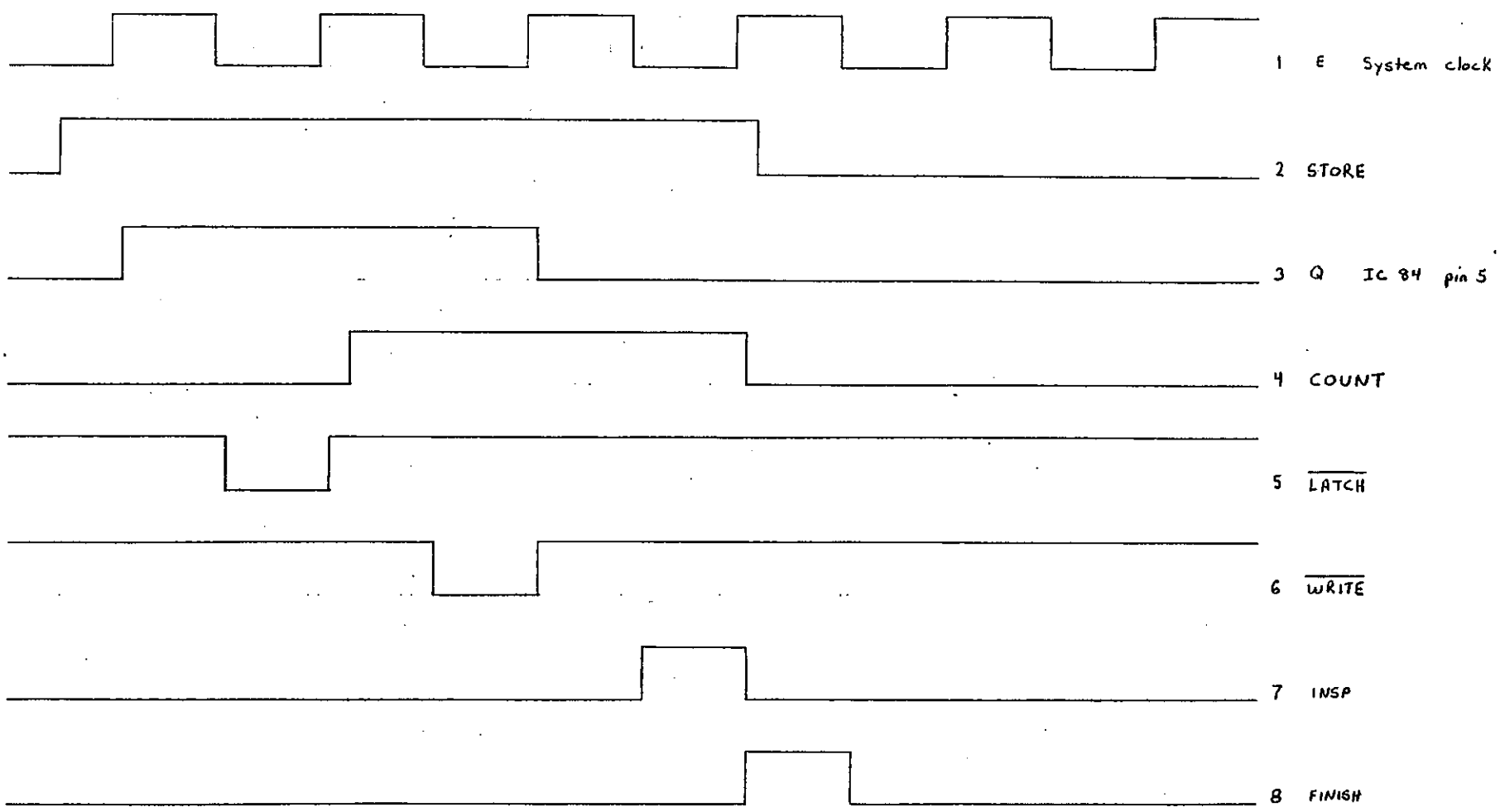


ADC CONTROL	AR-506E
DSD 9-17-84	SK-558

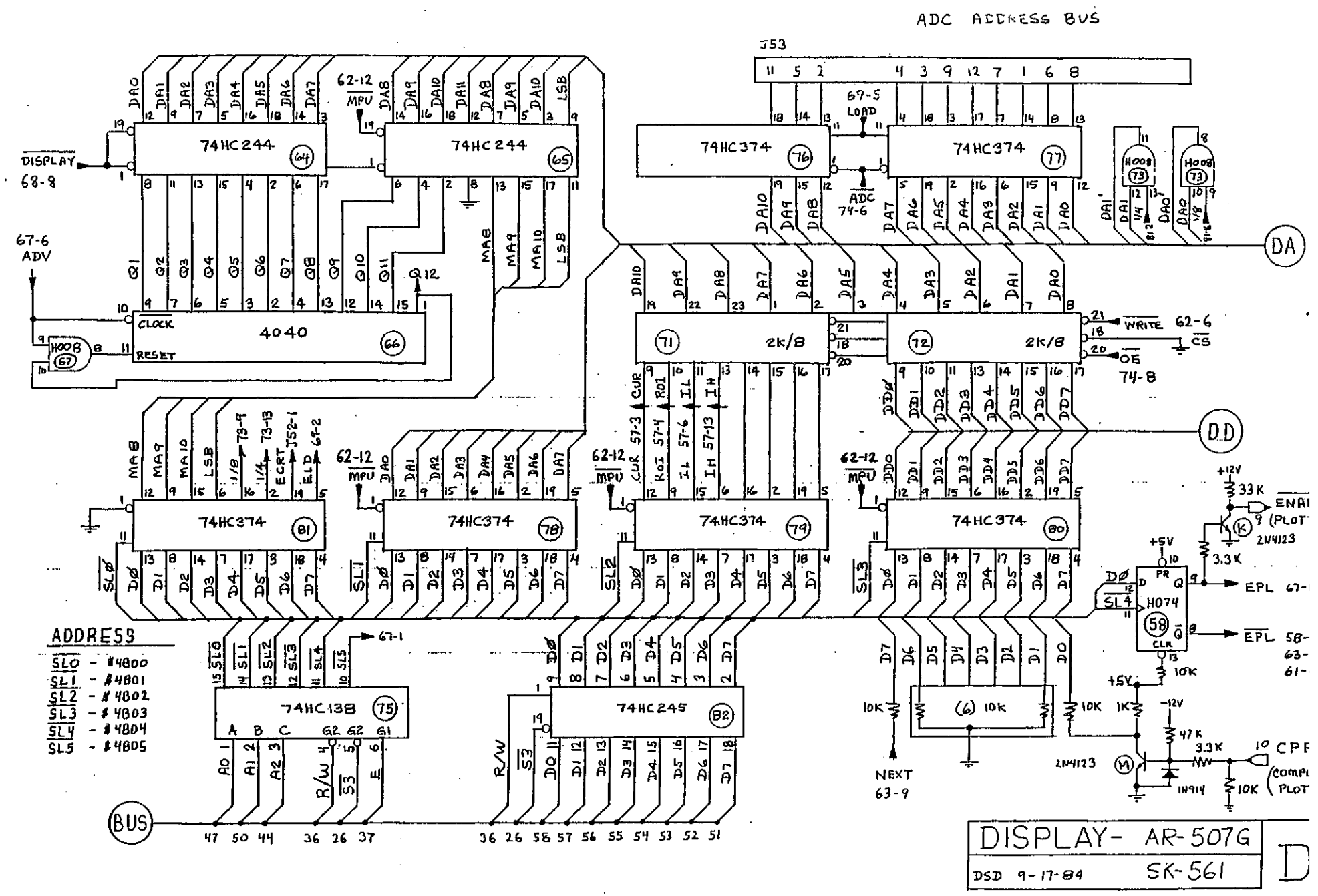
B3

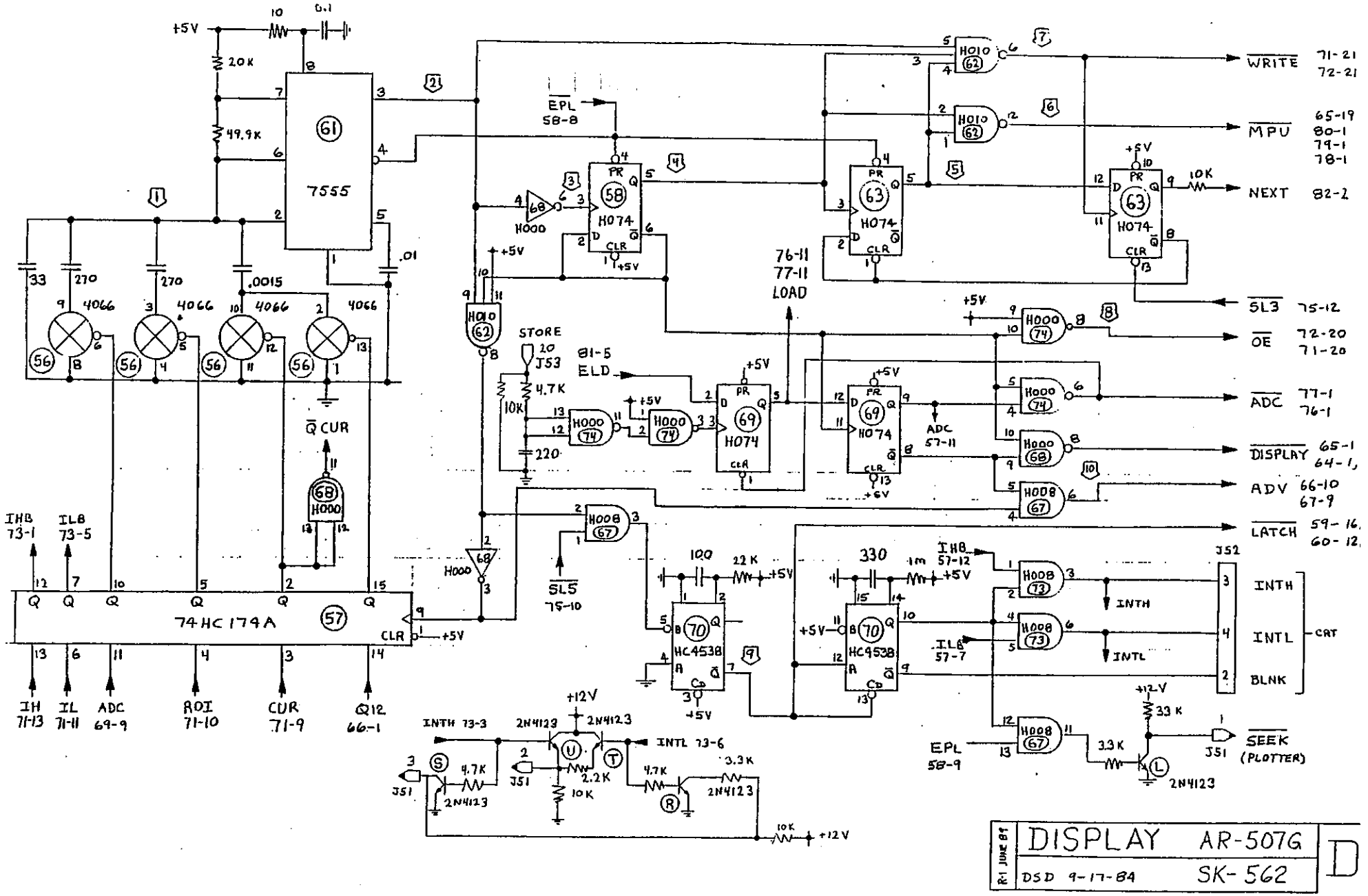

DATA MEMORY
43256C
56
HC00
BUS-32
BUS-7
+5VB
BUS-36 R/W
SELECT (L→A)
HC157
STROBE
HC193
CARRY
LOAD
CU
HC74
HC245
HC244
C193
LATCH
COUNT
OVER
WRITE
VN2222
1K
10K
BUS-11
REVISED TO USE 256K MEMORY CHIP
ADC CONTROL AR-623
RED 9/8/88 SK-627
B


LIVE TIME COUNTER
100 LTICs
for 1 Live time second
%OT = 100 − LTICs for
1 Real time second
E
BUS-37
RDD104
HC74
CLRLTIC
77-2
LTIC
96-13
BUS-10
4.7K
FIRQ
BUS-33
2N4123
CTS
96-15
10K
LG
J23-14
ADEN
77-16
ADCEN
96-11
ADCEN
J23-17
AS4
AS3
B
MCS and CPS
+5V
E'
89-4
HC192
RDD104
97-9
97-6
97-5
97-2
97-19
97-16
97-15
97-12
LS7060
ALTCT
COUNT
LOAD
RES
PULSE
J23-18
CLACTS
77-19
IC PART
79 - H004
80 - H010
88 - HC00
89 - H004
ADC CONTROL
AR-506E
DSD 9-17-84
SK-559
B4

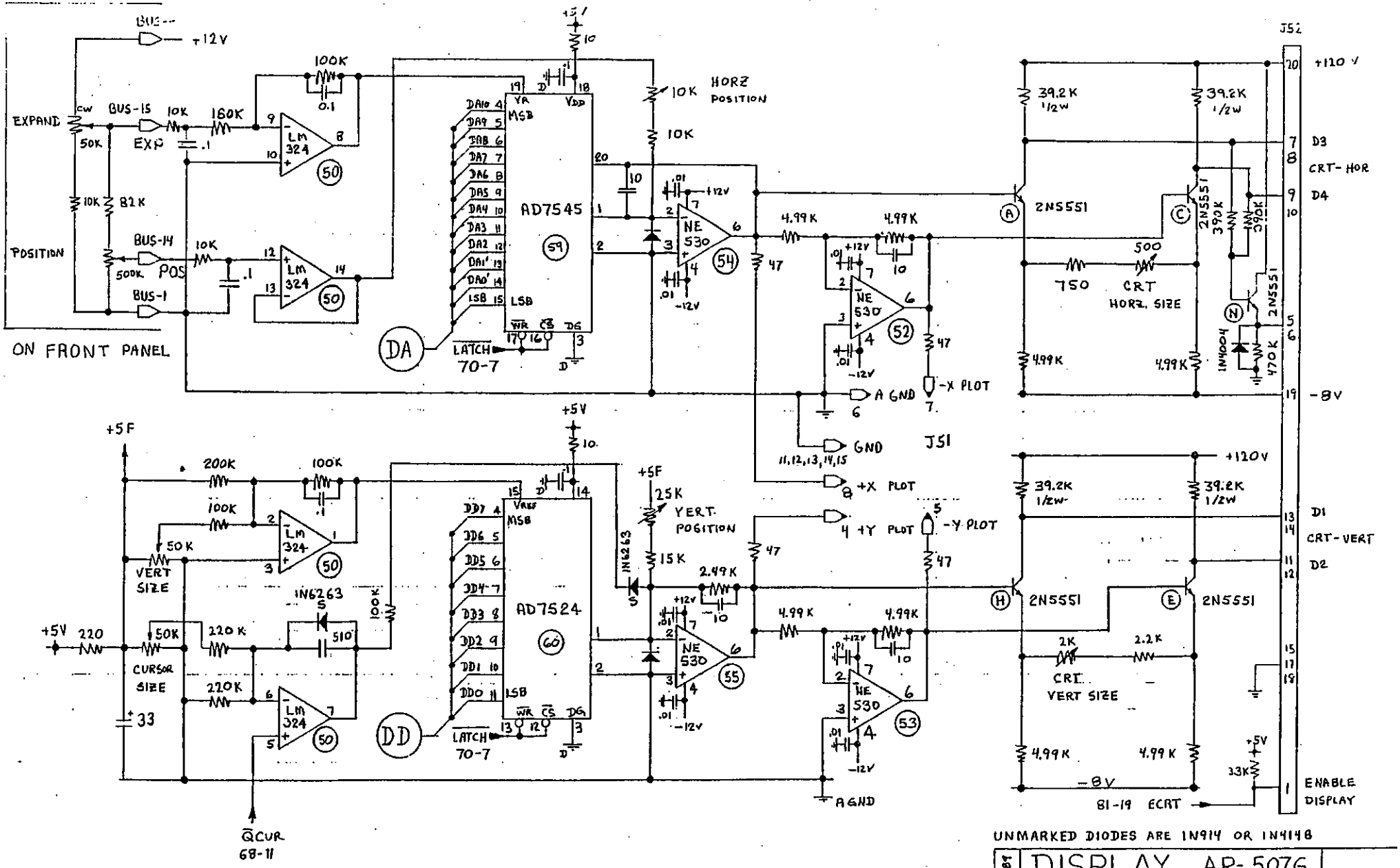


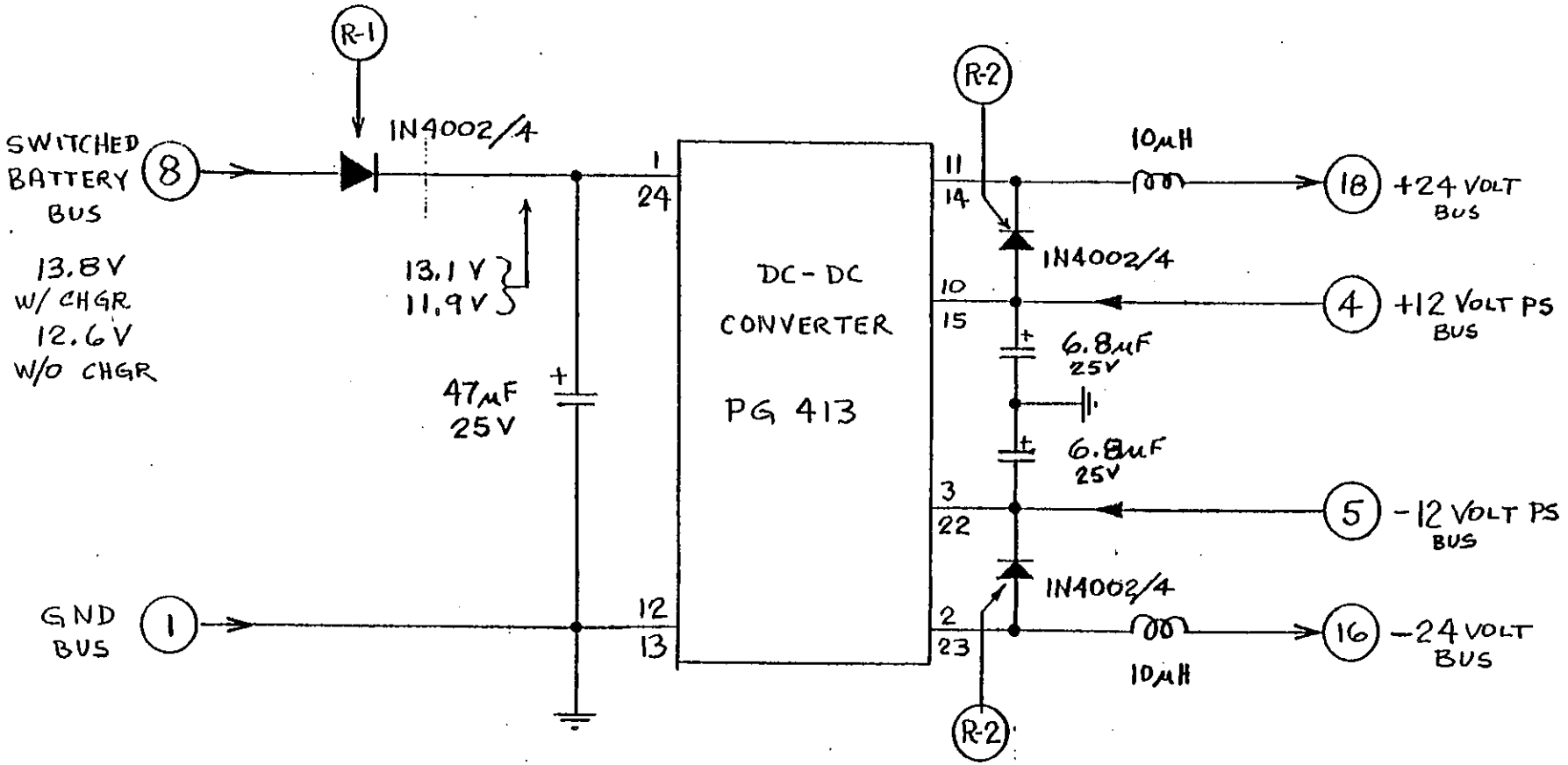
ADC CONTROL	AR-506E	B
DSD 9-17-84	SK-560	


ADC ADDRESS BUS
J53
74HC244 (64)
74HC244 (65)
74HC374 (76)
74HC374 (77)
4040 (66)
H008 (67)
H008 (73)
2K/8 (71)
2K/8 (72)
74HC374 (81)
74HC374 (78)
74HC374 (79)
74HC374 (80)
74HC138 (75)
74HC245 (82)
H074 (58)
DISPLAY
68-8
67-6
ADV
LOAD
69-5
ADC
74-6
WRITE
62-6
CS
OE
74-8
MPU
62-12
CLOCK
RESET
CUR
ROI
IL
IH
57-3
57-4
57-6
57-13
ECRT
ELP
73-9
73-13
JS2-1
69-2
1/8
1/4
DA
DD
ADDRESS
SL0 - $4800
SL1 - $4801
SL2 - $4802
SL3 - $4803
SL4 - $4804
SL5 - $4805
67-1
BUS
47 50 44 36 26 37
36 26 58 57 56 55 54 53 52 51
NEXT
63-9
+12V
+5V
-12V
33K
3.3K
1K
47K
10K
2N4123
1N914
ENAI
EPL 67-
EPL 58-
63-
61-
CPF
(COMPL
PLOT
DISPLAY- AR-507G
DSD 9-17-84
SK-561
D



R1 JUNE 81	DISPLAY AR-507G	D
	DSD 9-17-84 SK-562	

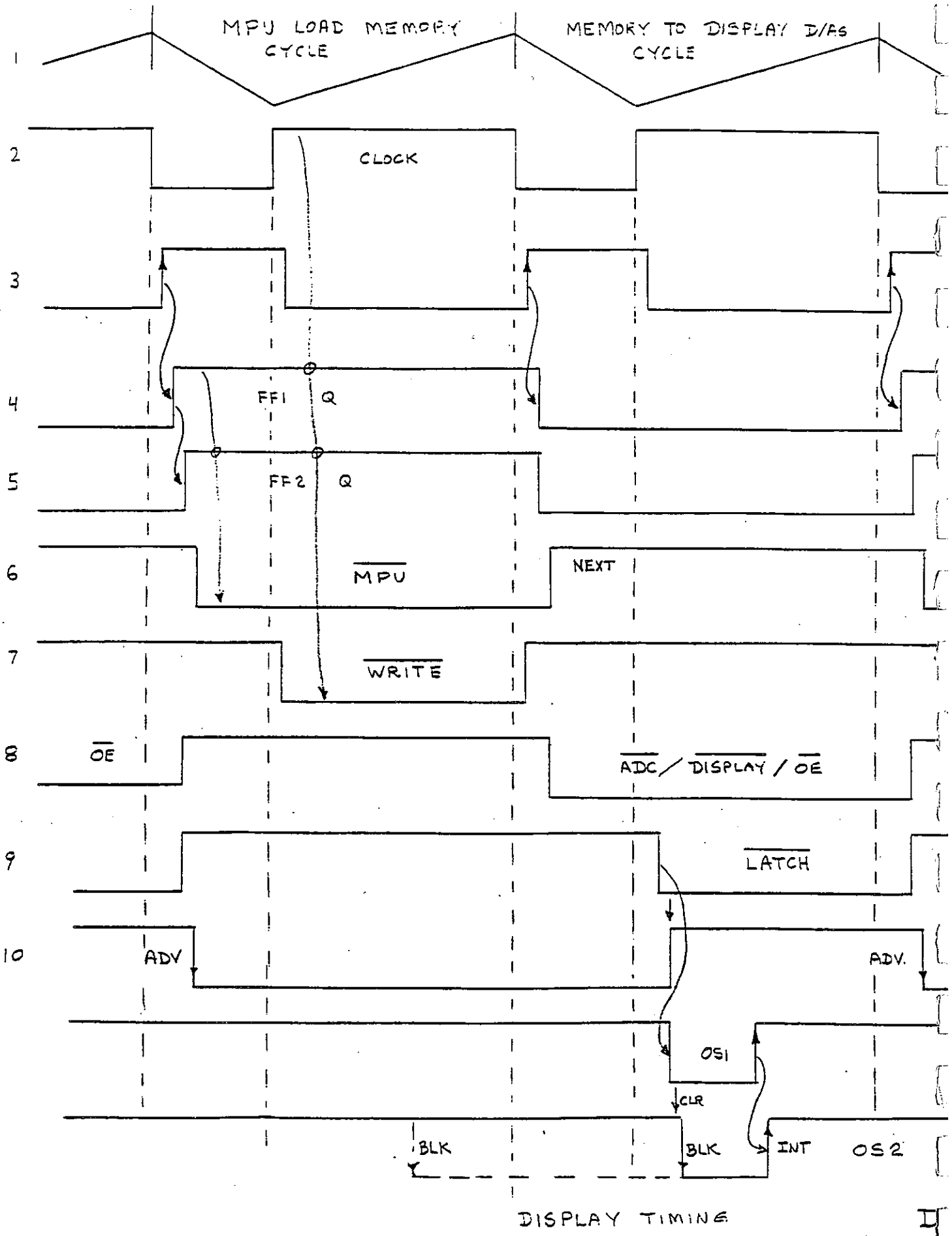

ON FRONT PANEL
EXPAND
POSITION
BUS-15
BUS-14
BUS-1
+12V
EXP
POS
50K
10K
82K
100K
160K
0.1
.1
LM 324
AD7545
DA
LATCH 70-7
HORZ POSITION
NE 530
4.99K
47
10
.01
+12V
-12V
A GND
-X PLOT
GND
11,12,13,14,15
+X PLOT
+Y PLOT
-Y PLOT
J51
J52
+110 V
D3
CRT-HOR
D4
2N5551
39.2K 1/2W
750
CRT HORZ. SIZE
500
390K
1N4004
470K
-8V
+5F
+5V
200K
VERT SIZE
CURSOR SIZE
220
220K
33
510
IN6263
100K
AD7524
DD
25K
YERT. POGISITION
15K
2.49K
CRT VERT SIZE
2K
2.2K
3.3K
D1
CRT-VERT
D2
ENABLE DISPLAY
81-19 ECRT
QCUR 68-11
A GND
UNMARKED DIODES ARE IN914 OR IN4148
DISPLAY AR-5076
DSI 9-17-84 SK-563
D3



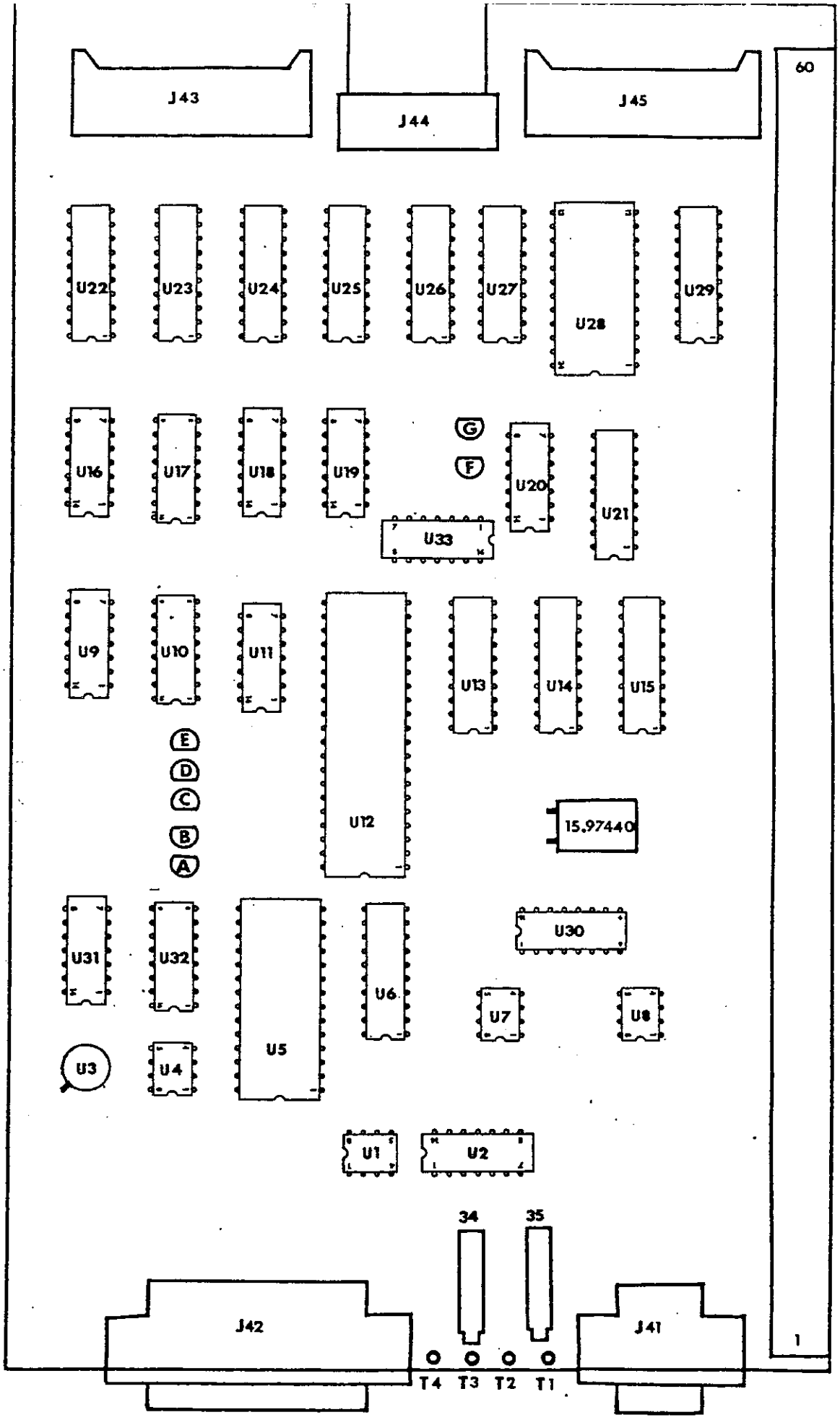
R-2	7-87	ADD TWO RECT, REMOVE TWO CA
R-1	10-85	ADD RECT., REMOVE IND.

OPTIONAL 24V PREAMP POWER AR-507G

D4



DISPLAY TIMING

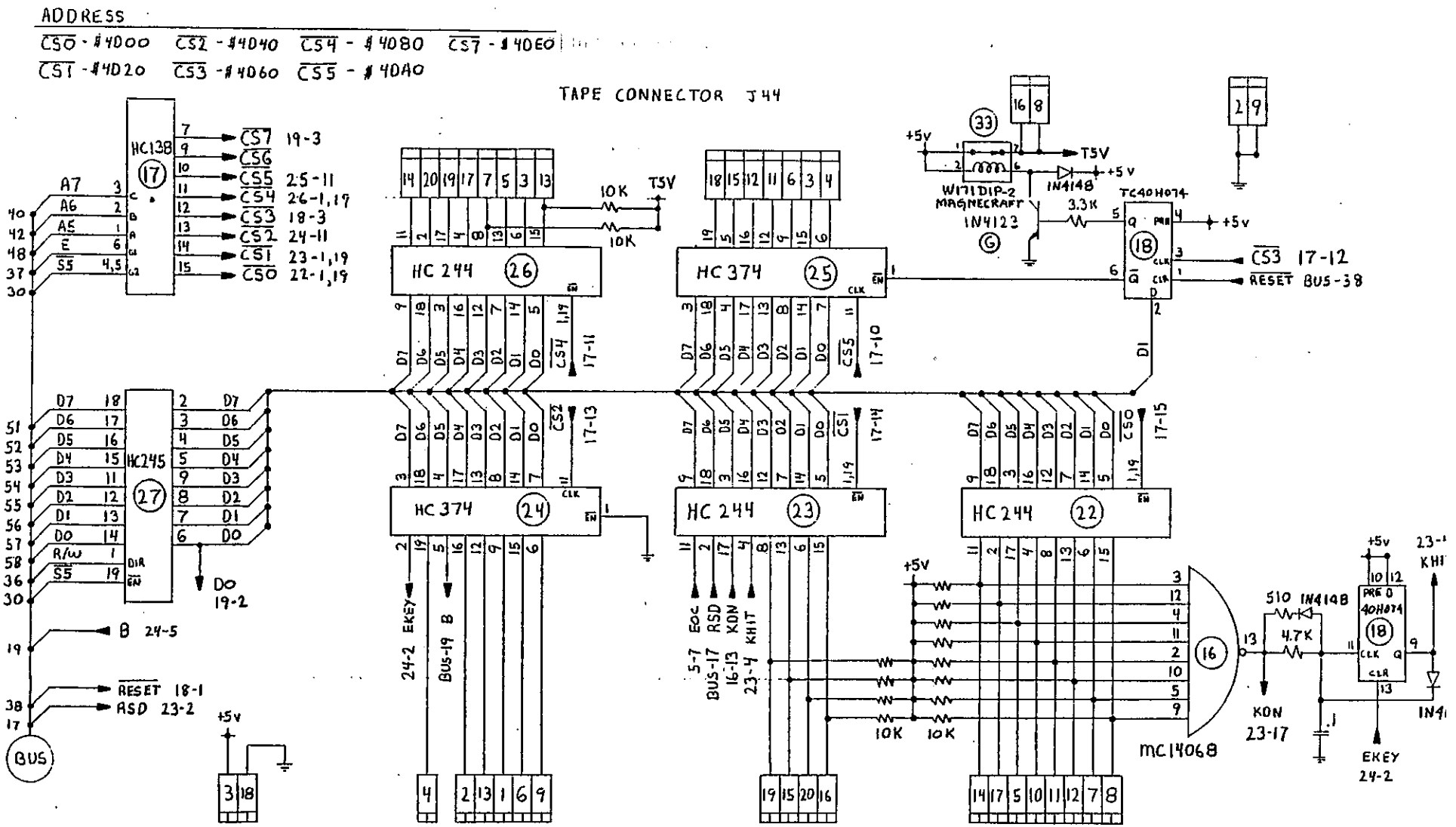


"C" MONITOR, STABILIZER, READOUT, LCD, TAPE, KEY BOARD AR511G

"C" MONITOR, STABILIZER, READOUT, LCD, TAPE, KEY BOARD AR511G

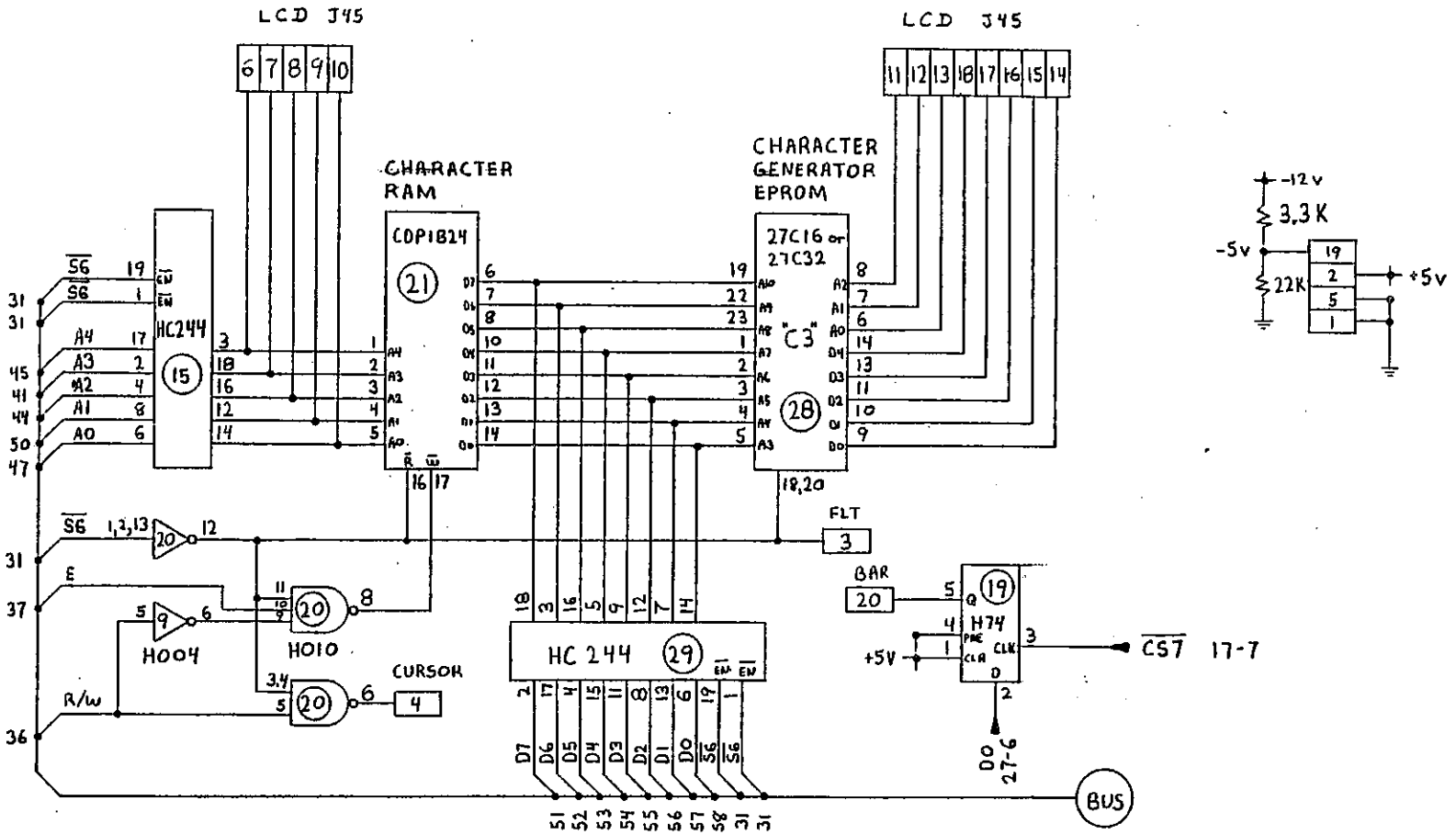
	LOCATION	PART #	MANUFACTURER
	U1	HA7-2515-5	HARRIS
	U2	LM319N	NATIONAL
	U3	AD584JH	ANALOG DEV.
	U4	LM358N	NATIONAL
	U5	ADC0809N	TI
	U6	AD7545KN	ANALOG DEV.
	U7	LM358N	NATIONAL
	U8	CA3240AE	RCA
	U9	TC40H004P	TOSHIBA
	U10	MC74HC138	MOTOROLA
	U11	TC40H010P	TOSHIBA
	U12	CDP1854ACE	RCA
	U13	MC145146P	MOTOROLA
	U14	TC74HC245P	TOSHIBA
*	U15	MC74HC244	MOTOROLA
	U16	MC14068B	MOTOROLA
	U17	MC74HC138	MOTOROLA
	U18	TC40H074P	TOSHIBA
*	U19	TC40H074P	TOSHIBA
*	U20	TC40H010P	TOSHIBA
*	U21	CPP1824CE	RCA
	U22	MC74HC244	MOTOROLA
	U23	MC74HC244	MOTOROLA
	U24	TC74HC374P	TOSHIBA
	U25	TC74HC374P	TOSHIBA
	U26	MC74HC244	MOTOROLA
	U27	TC74HC245P	TOSHIBA
*	U28	NMC27C320-55	NATIONAL
*	U29	MC74HC244	MOTOROLA
	U30	DG243CJ	SILICONIX
	U31	TC40H074P	TOSHIBA
	U32	TC74HC174P	TOSHIBA
	U33	W171 DIP-2	MAGNECRAFT
	34	43P103T050	SPECTROL
	35	43P501T050	SPECTROL
	J41	207084-1	AMP
	J42	206584-1	AMP
	J43	3428-1202	3M
	J44	3422	3M
*	J45	3428-1202	3M
	A	2N4125	FAIRCHILD
	B	2N4125	FAIRCHILD
	C	2N4123	MOTOROLA
	D	2N4123	MOTOROLA
	E	2N4123	MOTOROLA
	F	2N4123	MOTOROLA
	G	2N4123	MOTOROLA

* PARTS NOT INSTALLED IN 2056B. USED FOR 2056-4K-A LCD DRIVER ONLY.



AR-5116

R-1 JUNE 89	CONTROL-TAPE - KEY BOARD	C
	DSD 9-17-84 SK-565	

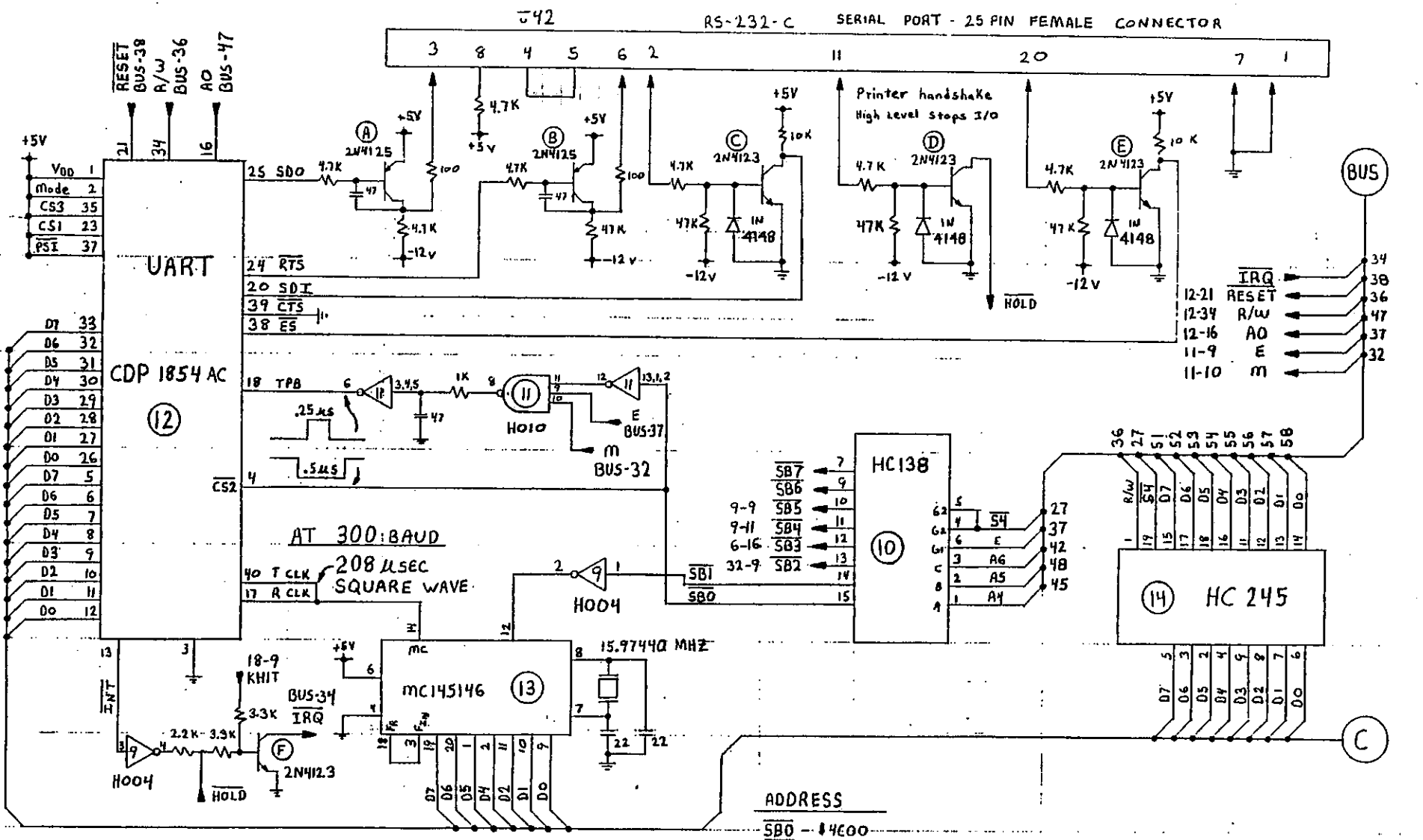


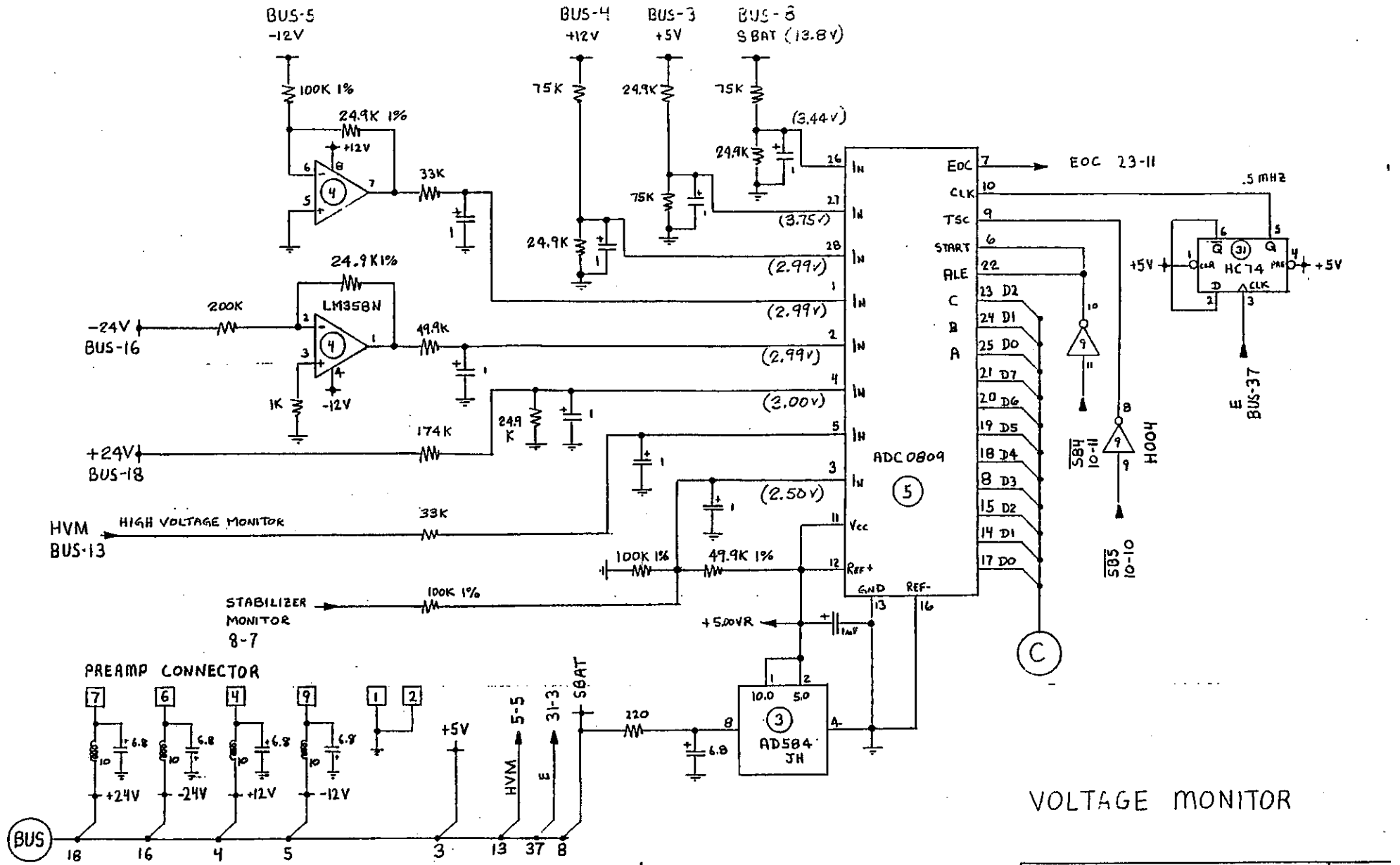
NOTE- ABOVE CIRCUITS ARE NOT INSTALLED OR USED IN 2056-B WITH EA-H2002SAR-Y LCD

ABOVE CIRCUITS REQUIRED FOR 2056-4K (A) WITH B956B LCD

AR-511G

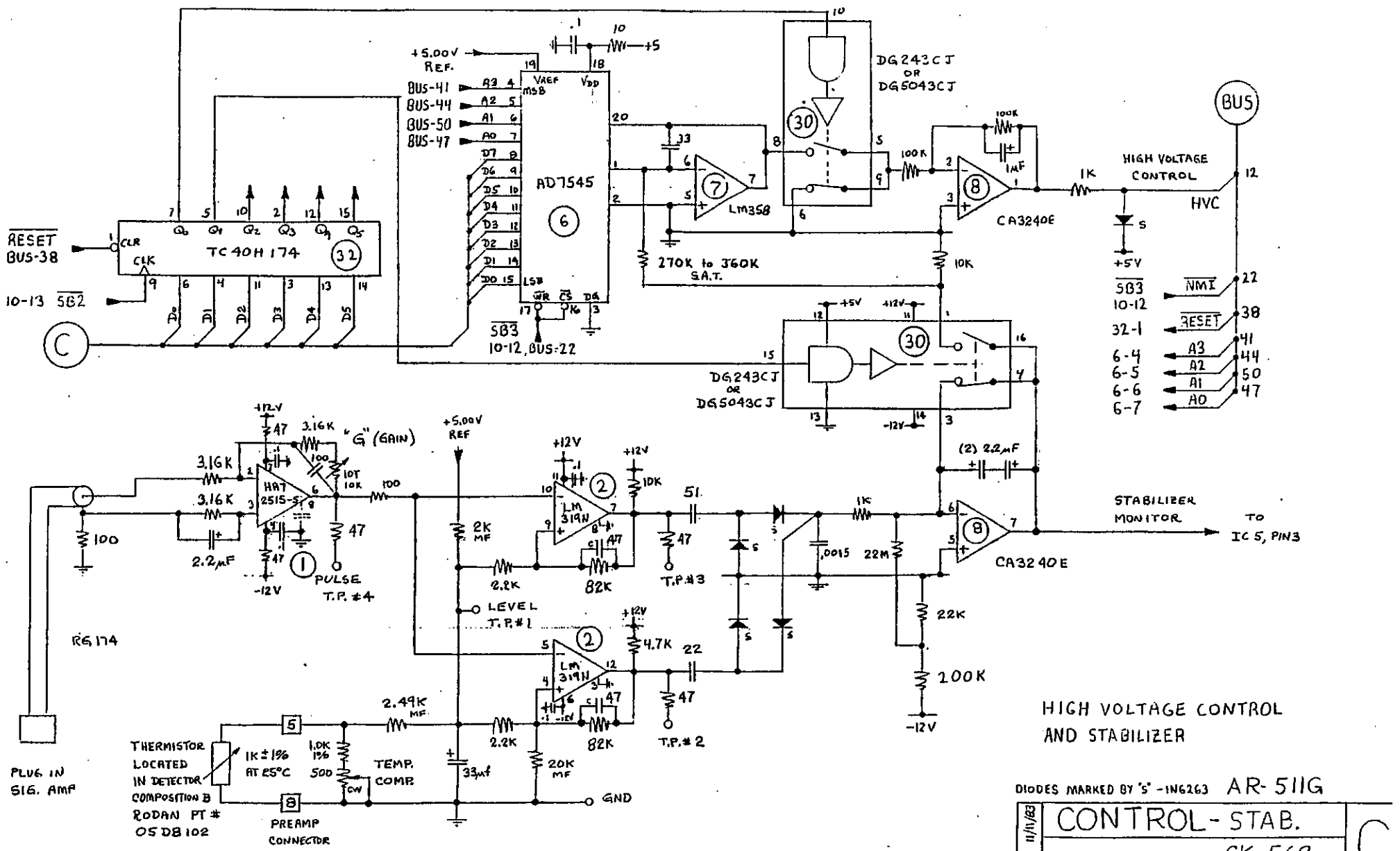
R-1 JUNE 84	CONTROL - LCD-B956B	C2
	DSD 9-17-84 SK-566	


RS-232-C SERIAL PORT - 25 PIN FEMALE CONNECTOR
3 8 4 5 6 2 11 20 7 1
Printer handshake
High level stops I/O
UART
CDP 1854 AC
12
MC145146
13
HC138
10
HC 245
14
HOLD
IRQ
RESET
R/W
AO
E
m
BUS
AT 300 BAUD
208 μSEC SQUARE WAVE
15.9744Q MHZ
ADDRESS
SB0 - $4C00
SB1 - $4C10
SB2 - $4C20
SB3 - $4C30
SB4 - $4C40
SB5 - $4C50
SB6 - $4C60
SB7 - $4C70
AR-511G
CONTROL - RS-232-C
DSD 9-17-84
SK-567
C3



VOLTAGE MONITOR

CONTROL- AR-511G	CL
DSD 9-17-84	SK-568

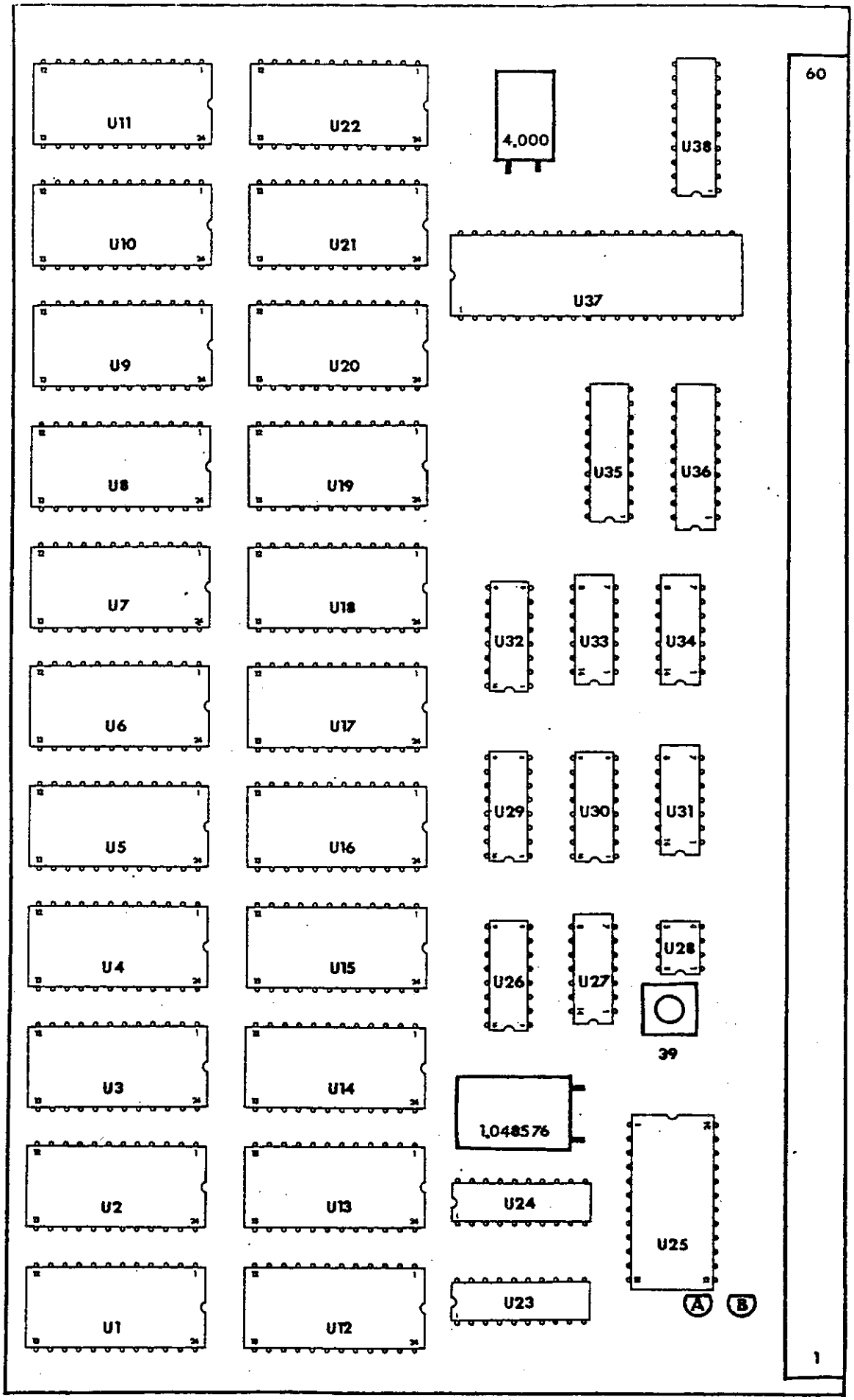


HIGH VOLTAGE CONTROL AND STABILIZER

DIODES MARKED BY 'S' - 1N6263

AR-511G

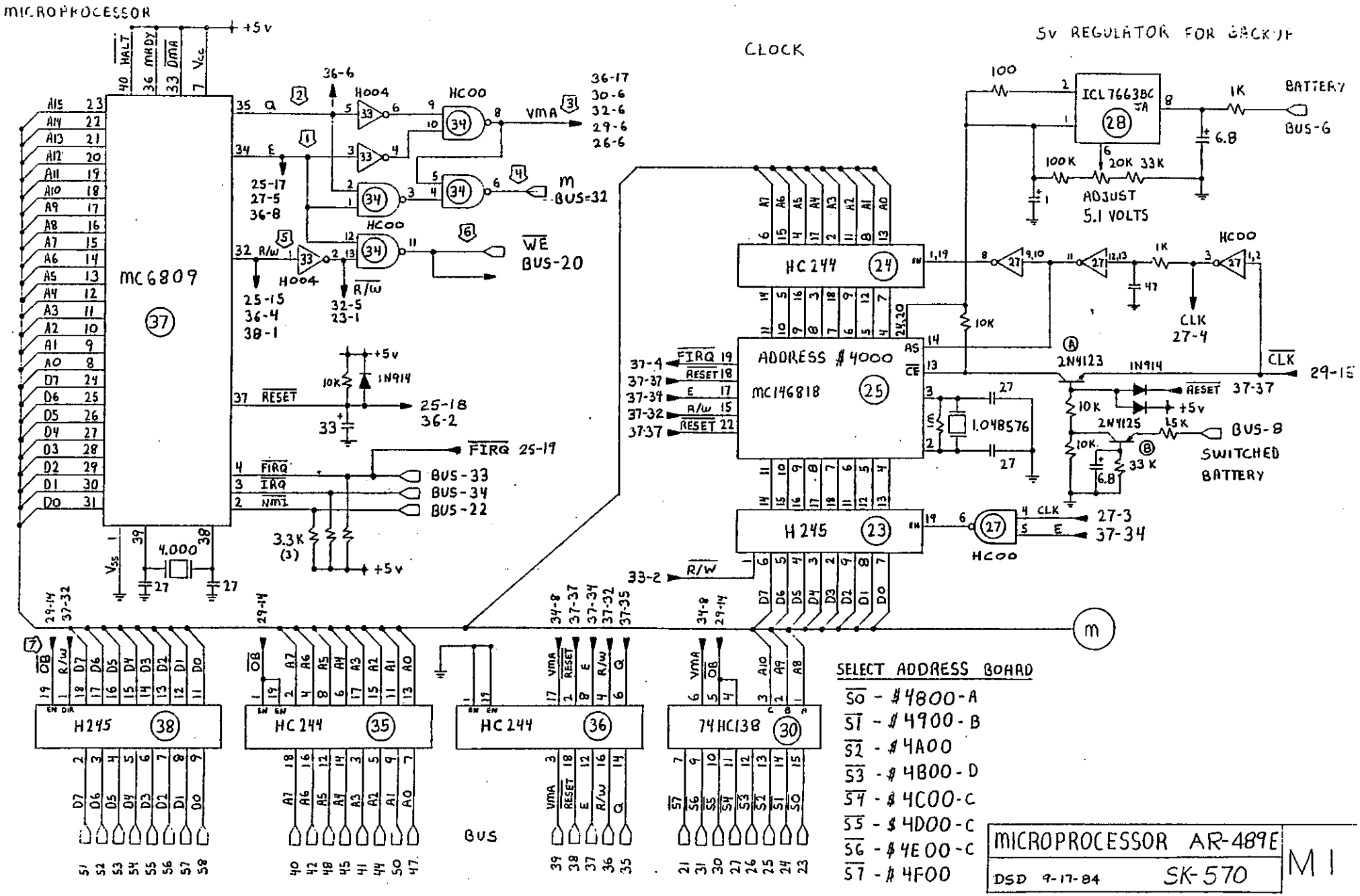
R-1 11/11/83	CONTROL - STAB.	C
	DSD 9-17-84	SK-569



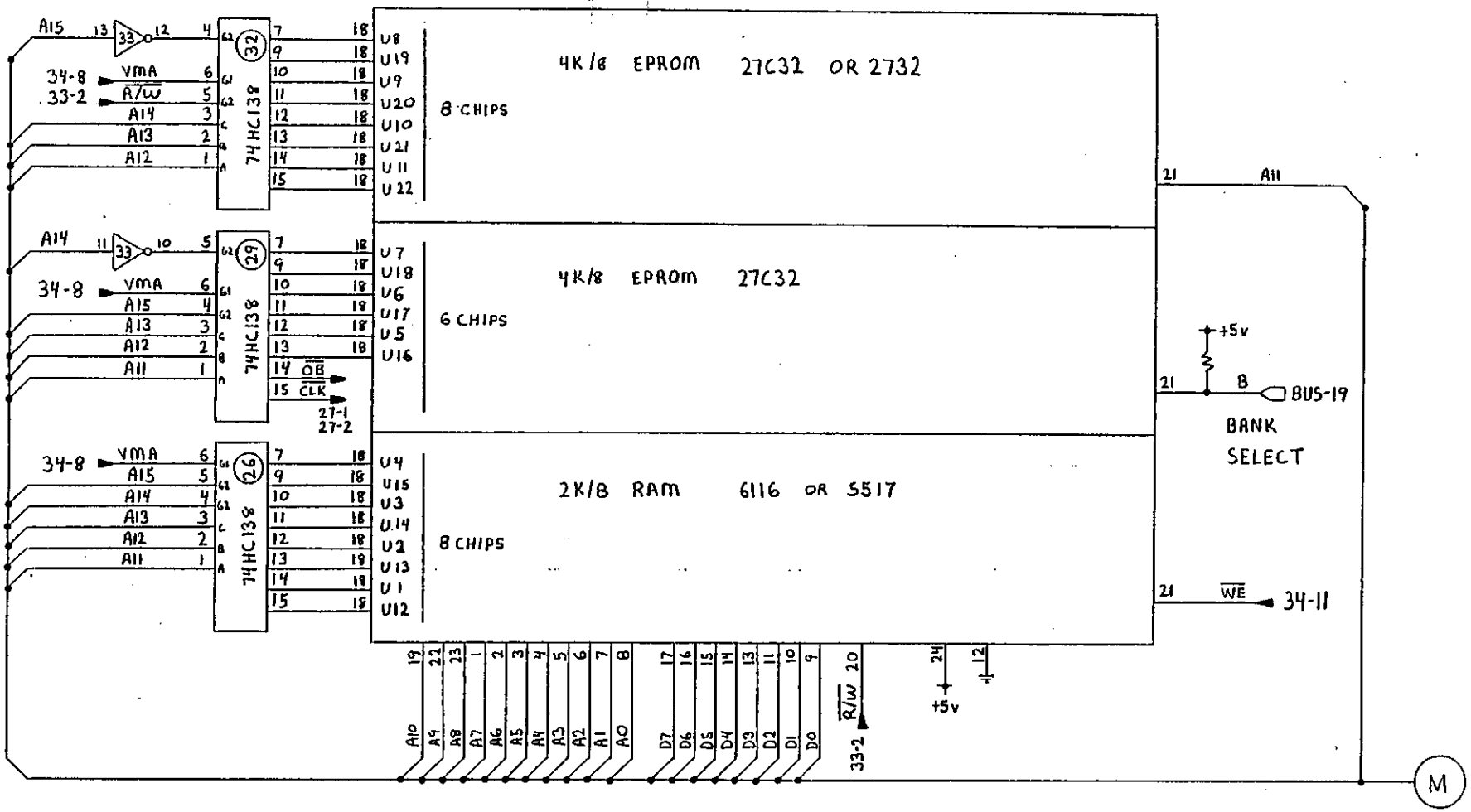
"M" MEMORY, CLOCK, MPU, PROGRAM LOCATION, PC BOARD AR489E

"M" MEMORY, CLOCK, MPU, PROGRAM LOCATION, PC BOARD AR489E

LOCATION	PART #	MANUFACTURER
U1	TC5517APL	TOSHIBA
U2		
U3		
U4		
U5		
U6		
U7		
U8	NMC27C32Q-45	NATIONAL
U9	M5L2732K	MITSUBISHU EL.
U10	M5L2732K	MITSUBISHU EL.
U11	M5L2732K	MITSUBISHU EL.
U12	TC5517APL	TOSHIBA
U13		
U14		
U15		
U16		
U17		
U18		
U19		
U20	M5L2732K	MITSUBISHU EL.
U21	M5L2732K	MITSUBISHU EL.
U22	M5L2732K	MITSUBISHU EL.
U23	TC40H245P	TOSHIBA
U24	MC74HC244	MOTOROLA
U25	MC146818P	MOTOROLA
U26	MC74HC138	MOTOROLA
U27	MC74HC00	MOTOROLA
U28	ICL7663BCJA	INTERSIL
U29	MC74HC138	MOTOROLA
U30	MC74HC138	MOTOROLA
U31		
U32	MC74HC138	MOTOROLA
U33	TC40H004P	TOSHIBA
U34	MC74HC00	MOTOROLA
U35	MC74HC244	MOTOROLA
U36	MC74HC244	MOTOROLA
U37	MC6809P	MOTOROLA
U38	TC40H245P	TOSHIBA
39	63P203	SPECTROL
A	2N4123	MOTOROLA
B	2N4125	FAIRCHILD

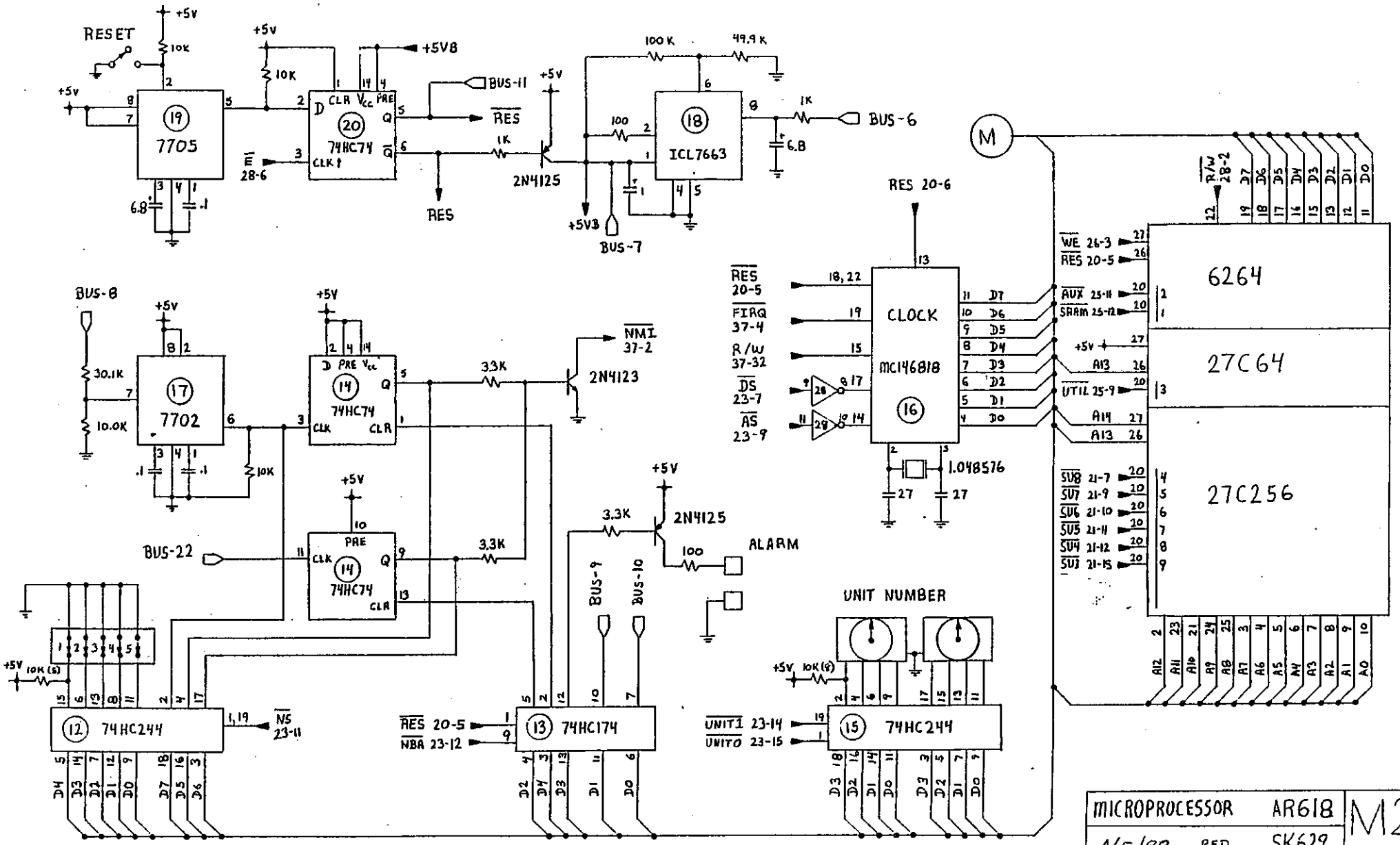

MICROPROCESSOR
MC6809
37
+5v
HALT
MRDY
DMA
Vcc
Vss
4.000
27
27
3.3K
(3)
+5v
CLOCK
H004
HC00
VMA
m
BUS=32
WE
BUS-20
R/W
25-15
36-4
38-1
32-5
23-1
25-17
27-5
36-8
36-6
36-17
30-6
32-6
29-6
26-6
10K
1N914
37 RESET
25-18
36-2
33
FIRQ 25-19
IRQ
NMI
BUS-33
BUS-34
BUS-22
5v REGULATOR FOR BACK-UP
ICL7663BC
JA
28
100
1K
BATTERY
BUS-6
6.8
100K
20K 33K
ADJUST
5.1 VOLTS
HC244
24
ADDRESS $4000
MC146818
25
AS
CE
1.048576
2N4123
1N914
2N4125
15K
BUS-8
SWITCHED
BATTERY
33K
H245
23
CLK
27-4
CLK
29-15
RESET 37-37
+5v
27-3
37-34
37-4 FIRQ 19
37-37 RESET 18
37-34 E 17
37-32 R/W 15
37-37 RESET 22
33-2 R/W
SELECT ADDRESS BOARD
S0 - $4800-A
S1 - $4900-B
S2 - $4A00
S3 - $4B00-D
S4 - $4C00-C
S5 - $4D00-C
S6 - $4E00-C
S7 - $4F00
H245
38
HC244
35
HC244
36
74HC138
30
BUS
MICROPROCESSOR AR-489E
DSD 9-17-84
SK-570
M1

MEMORY

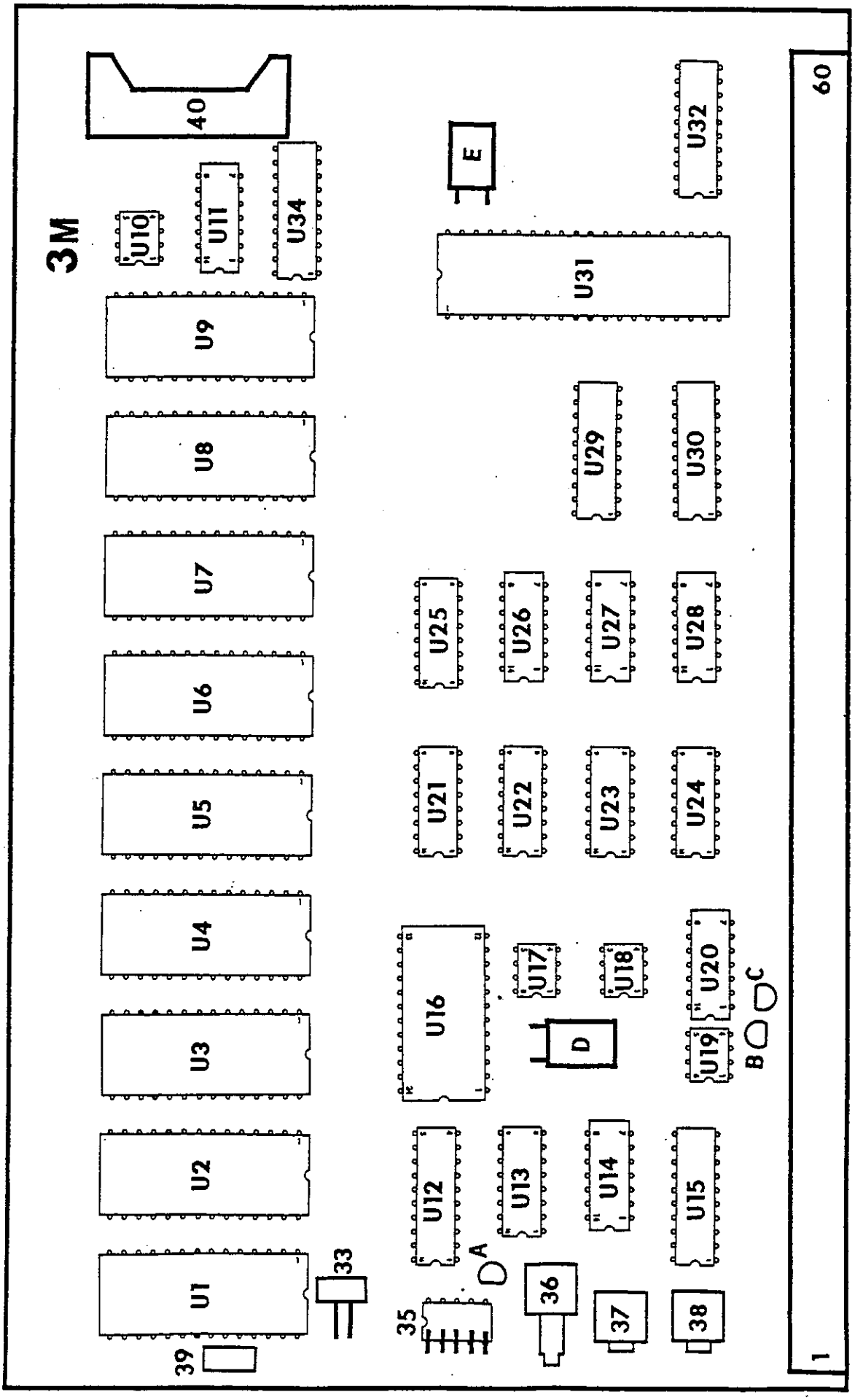


OB
TO 30-4
TO 30-5
TO 35-19
TO 35-1
TO 38-19

MICROPROCESSOR AR489E	M
DSD 9-17-84 SK-571	



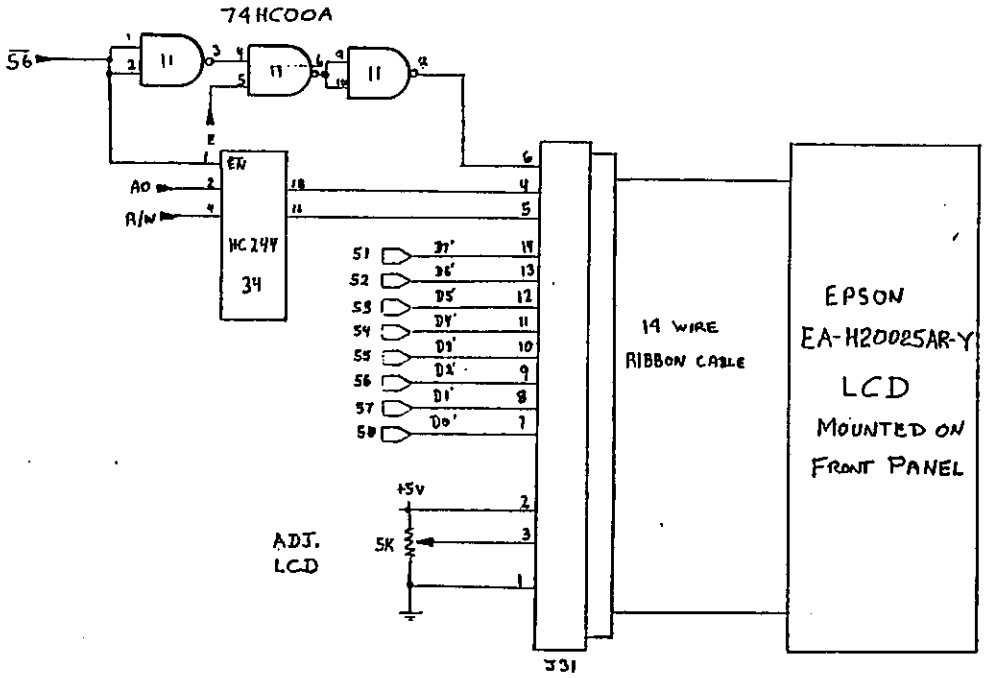
MICROPROCESSOR	AR618	M2
4/5/88	RED	SK629	



"3M" MEMORY, CLOCK, MPU, PROGRAM LOCATION, PC BOARD AR618

"3M" MEMORY, CLOCK, MPU, PROGRAM LOCATION, PC BOARD AR618

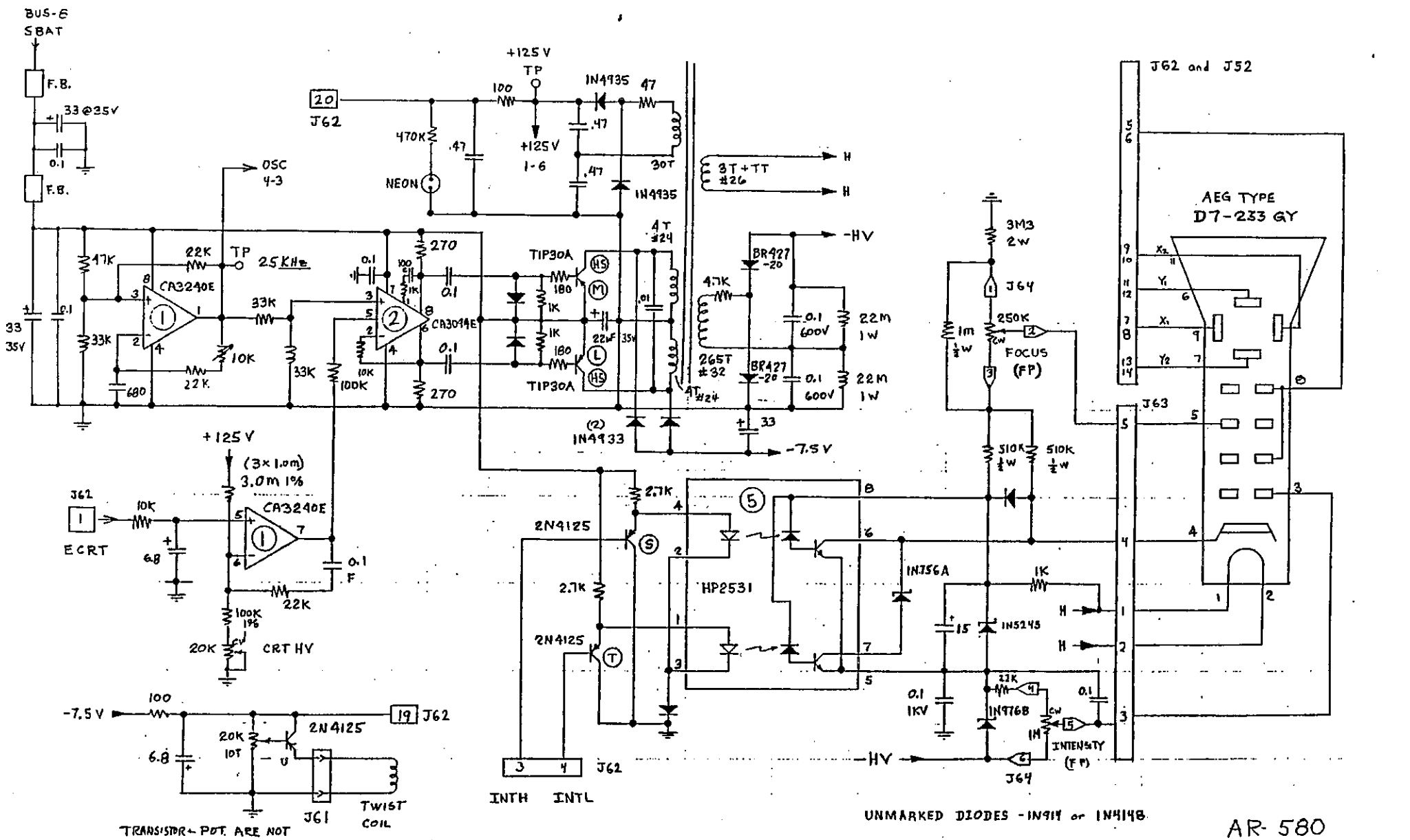
LOCATION	PART #	MANUFACTURER
U1	HM6264LP-15	HITACHI
U2	HM6264LP-15	HITACHI
U3	HN27C64G-15	HITACHI
U4		
U5		
U6		
U7		
U8		
U9	NMC27C256Q25	TOSHIBA
U10		
U11	TC74HC00P	TOSHIBA
U12	TC74HC244P	TOSHIBA
U13	TC74HC174P	TOSHIBA
U14	TC74HC74P	TOSHIBA
U15	TC74HC244P	TOSHIBA
U16	HD146818P	HITACHI
U17	TL7702ACP	TI
U18	ICL7663CPA	INTERSIL
U19	TL7705ACP	TI
U20	TC74HC74P	TOSHIBA
U21	TC74HC138P	TOSHIBA
U22	TC74HC174P	TOSHIBA
U23	TC74HC138P	TOSHIBA
U24	TC74HC138P	TOSHIBA
U25	TC74HC139P	TOSHIBA
U26	TC74HC00P	TOSHIBA
U27	MC74HC266	MOTOROLA
U28	MC74HC04	MOTOROLA
U29	TC74HC244P	TOSHIBA
U30	TC74HC244P	TOSHIBA
U31	HD6809P	HITACHI
U32	TC74HC245P	TOSHIBA
33	22-05-3021	MOLEX
U34	TC74HC244P	TOSHIBA
35	435802-4	AMP
36	TP11H 8AB	MAX
37	231002G	EECO
38	231002G	EECO
39	3386W-1-502	BOURNS
40	3314-5202	3M
TRANSISTORS		
A,C	2N4125	MOTOROLA
B	2N4123	MOTOROLA
CRYSTALS		
D	1.048576	CALMAX
E	4.000	FOX



NOTE- ABOVE PARTS ADDED ON "3M" BOARD TO DRIVE NEW LCD
PROM LOCATIONS U9 + U10 ON "2M" BOARD REMOVED.
PROM LOCATION U11 MOVED TO U9 ON "3M" BOARD.

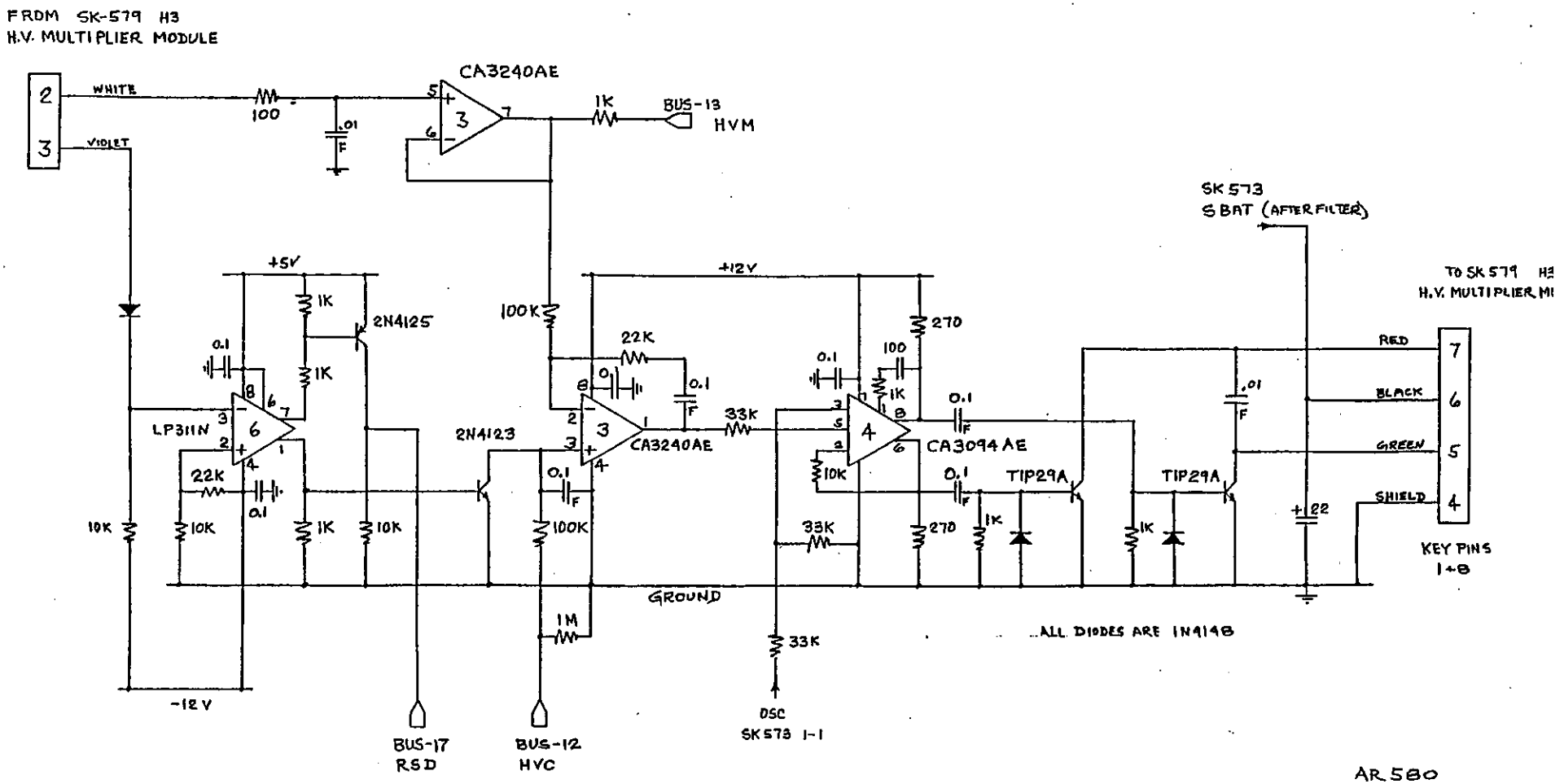
AR618

R-1 6/2/89	LCD DRIVER "3M" BOARD	M3
	4/5/88 RED SK-630	



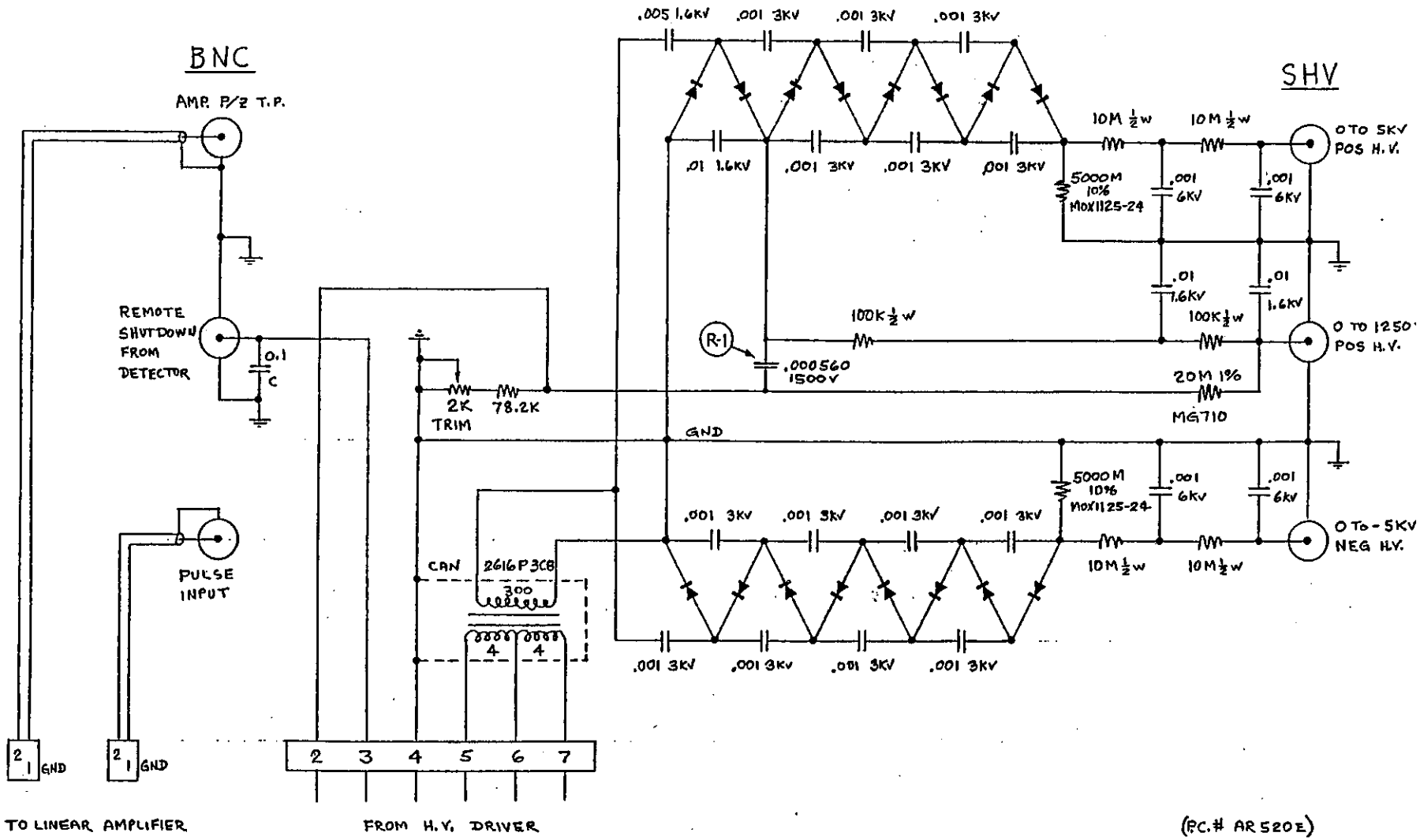
AR-580

R1 MAY 83	HIGH VOLTAGE	2H-1
	DSD 10-30-82 SK-573	



AR580

R-1 MAY 89	H.V. DRIVER	2H
	DSD 9-8-88 SK631	



(P.C.# AR520E)

R-1 5/88	H.V. MULTIPLIER MODULE	
	DSD 11-8-84 SK-579	H

RED/GREEN LED

DIALIGHT
559-3001-001

510

2 4

CURSOR

SWITCHCRAFT
29306

14 18 17

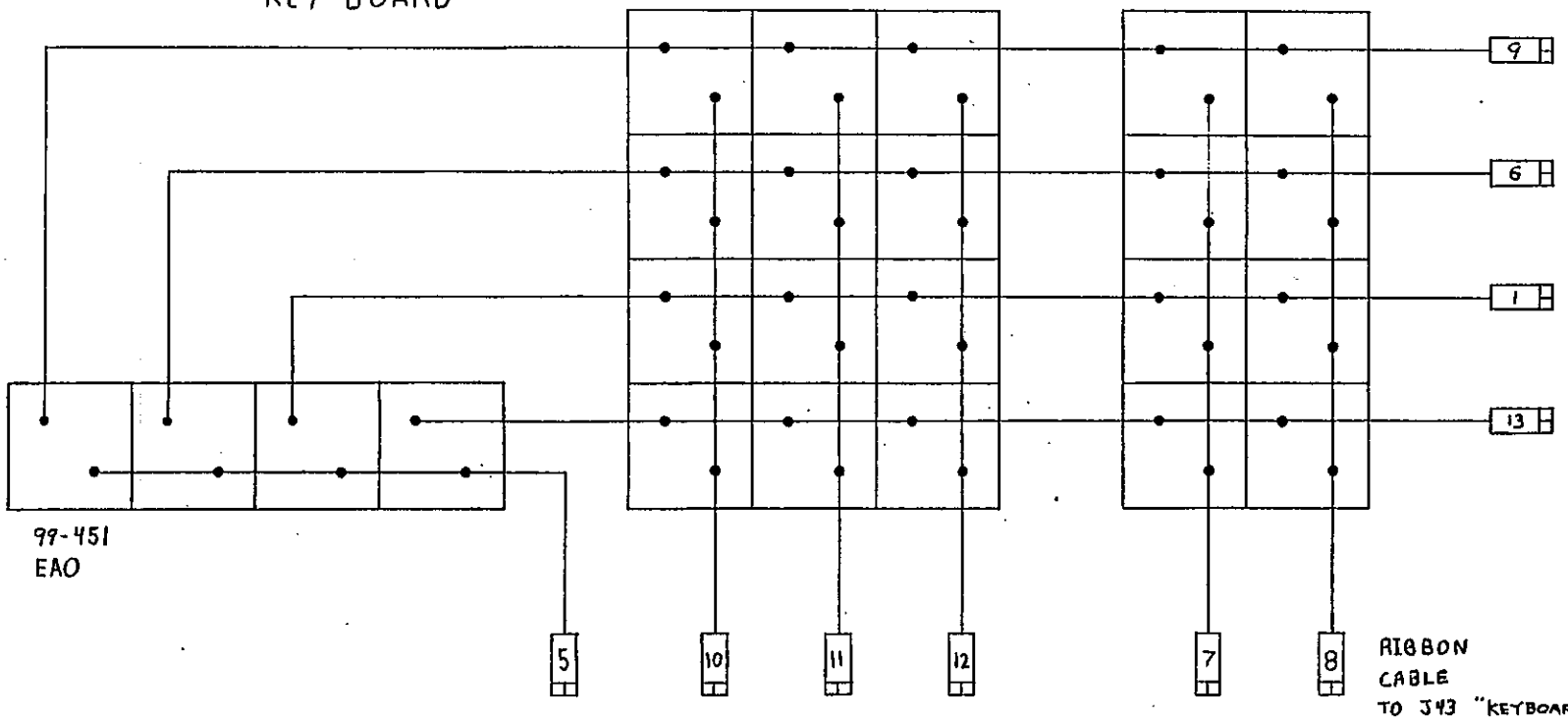
12 POSITION SWITCH

513374-12-C GRAYHILL FULL SCALE

8 4 2 1 GND

19 15 20 16 18

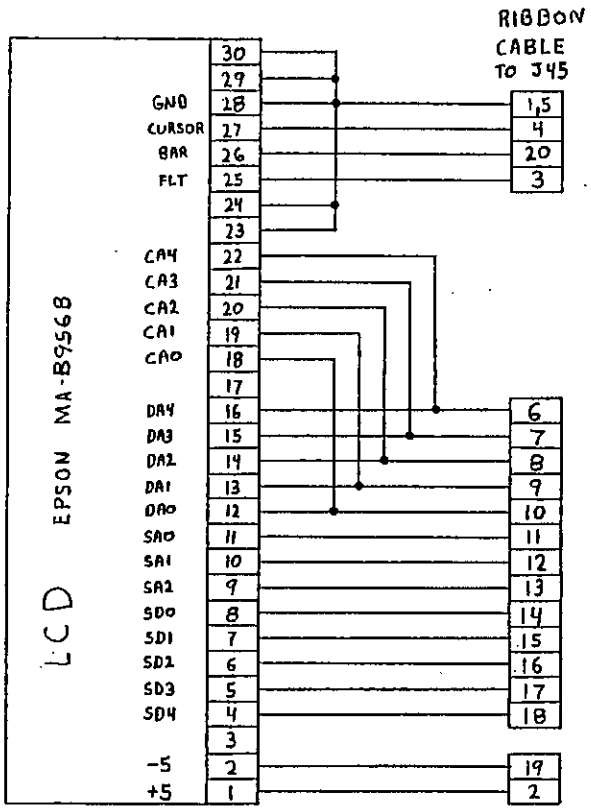
KEY BOARD



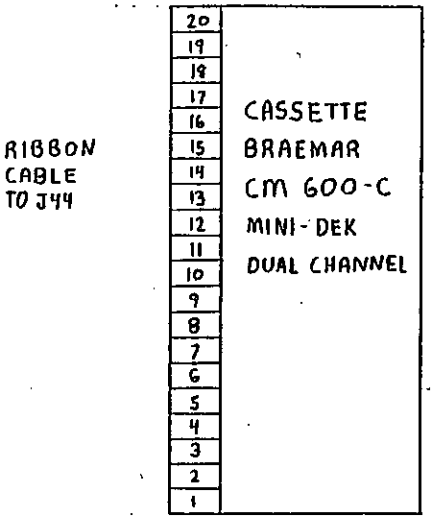
99-451
EAO

RIBBON
CABLE
TO J43 "KEYBOARD"

R-1 JUNE 87	FRONT PANEL AR-508E	
	DSD 9-17-84 SK-575	F



NOTE- THIS LCD IS USED IN 2056-4K (A) ONLY AND IS DISCONTINUED FOR LATER MODELS



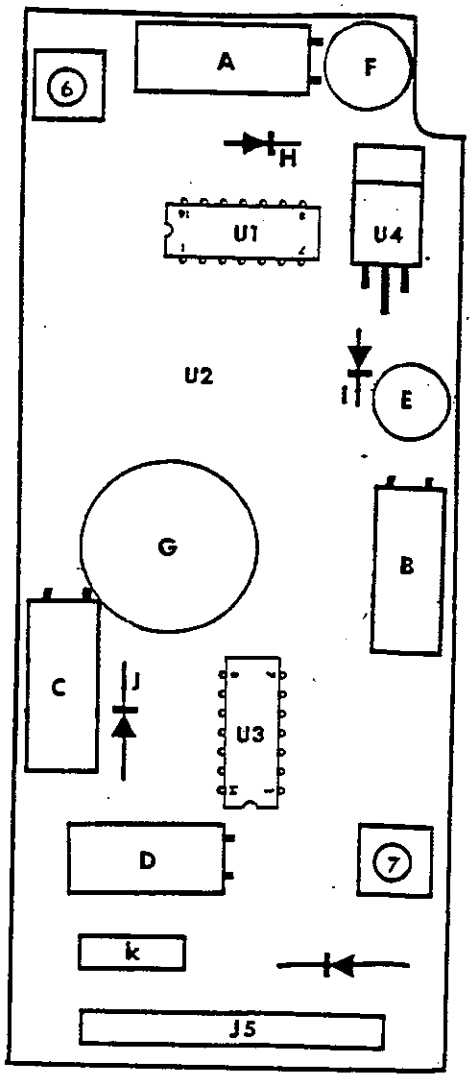
NOTE: See also D3, H1, P, M3 for FRONT PANEL CIRCUITS

R-1 JUNE 89	FRONT PANEL AR-508E	
	DSD 9-17-84	SK-576

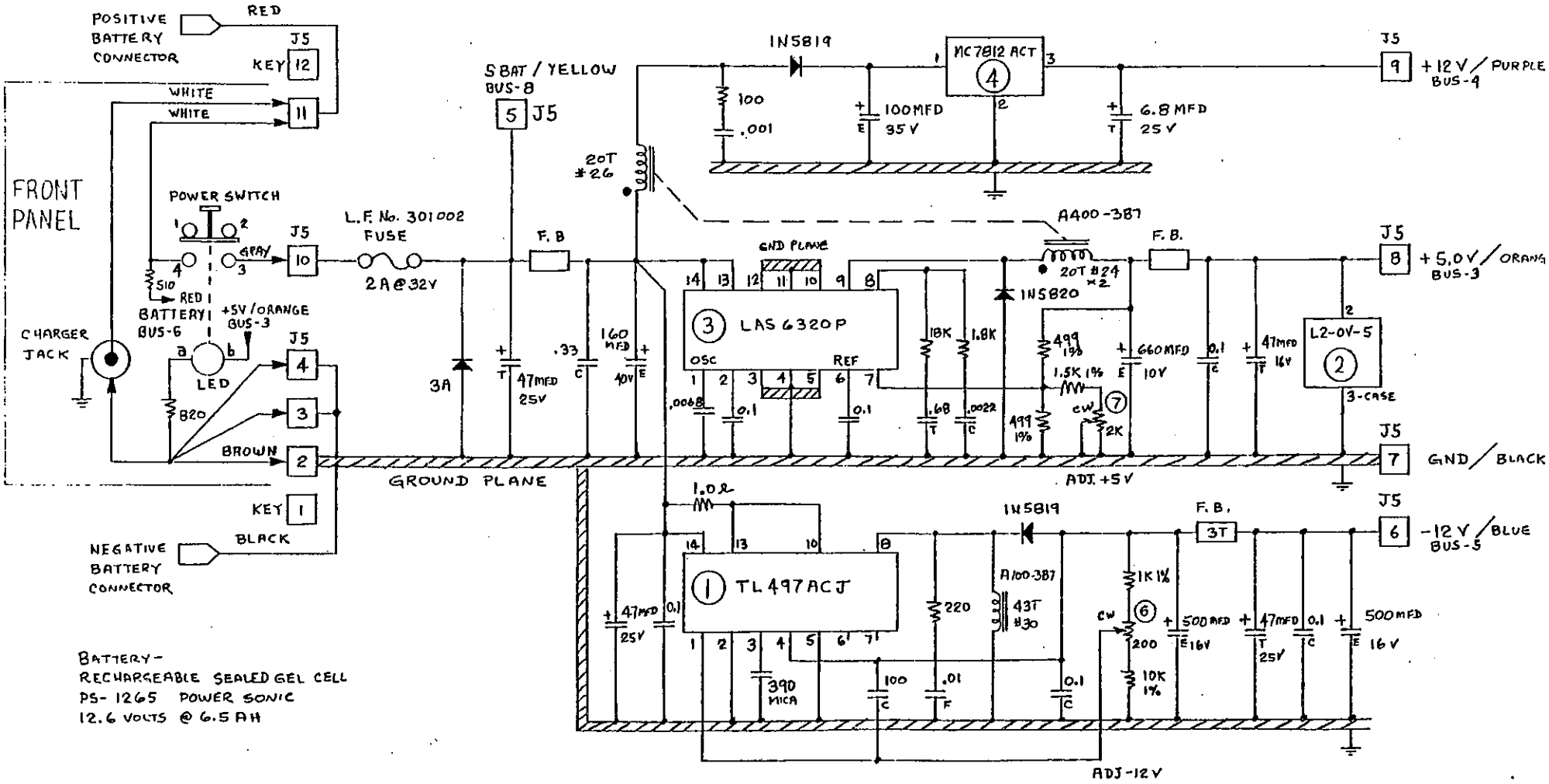
F

"LV" LOW VOLTAGE REGULATOR

LOCATION	PART #	MANUFACTURER
U1	----TL497AIN	TEXAS INST.
U2	----L20V5	LAMBDA
U3	----LAS6320P	LAMBDA
U4	----7812ACT	MOTOROLA
5	----09-60-1101	MOLEX
6	----63P201	SPECTROL
7	----63P202	SPECTROL
CAPACITORS		
A,C,	---VPR501U010EIA	MALLORY
B	----VPR661U010EIA	MALLORY
D	----VPR161U010EIA	MALLORY
E	----503D107F025NC	ELNA
FERRITE		
F	----1107PA100 3B7	FERROXCUBE
G	----2213PA400 3B7	FERROXCUBE
RECTIFIERS		
H,I,	--1N5819	
J	----1N5820	MOTOROLA
FUSE K	----301002	

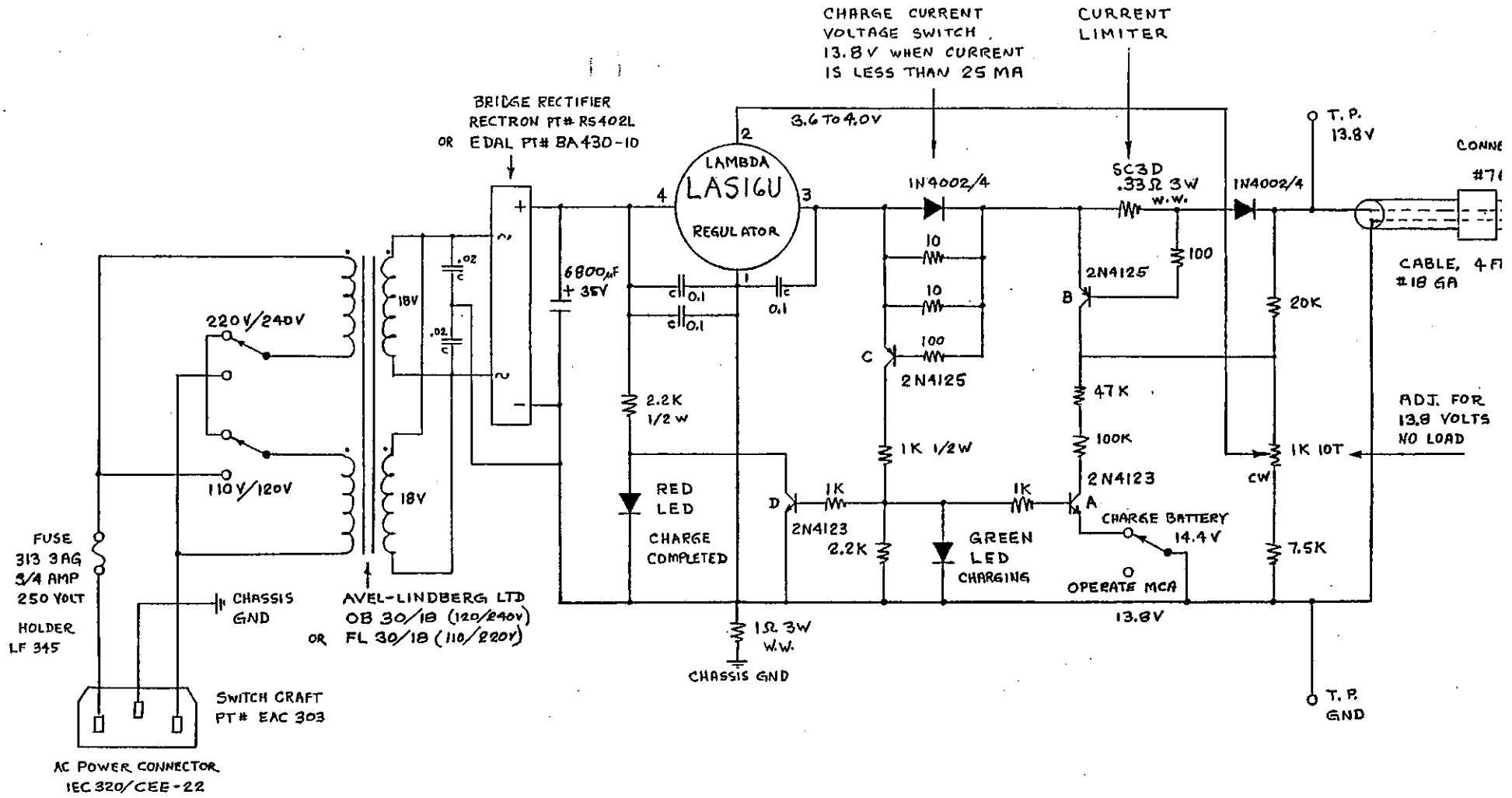


"LV" PC BOARD AR548



BATTERY -
RECHARGEABLE SEALED GEL CELL
PS-1265 POWER SONIC
12.6 VOLTS @ 6.5 AH

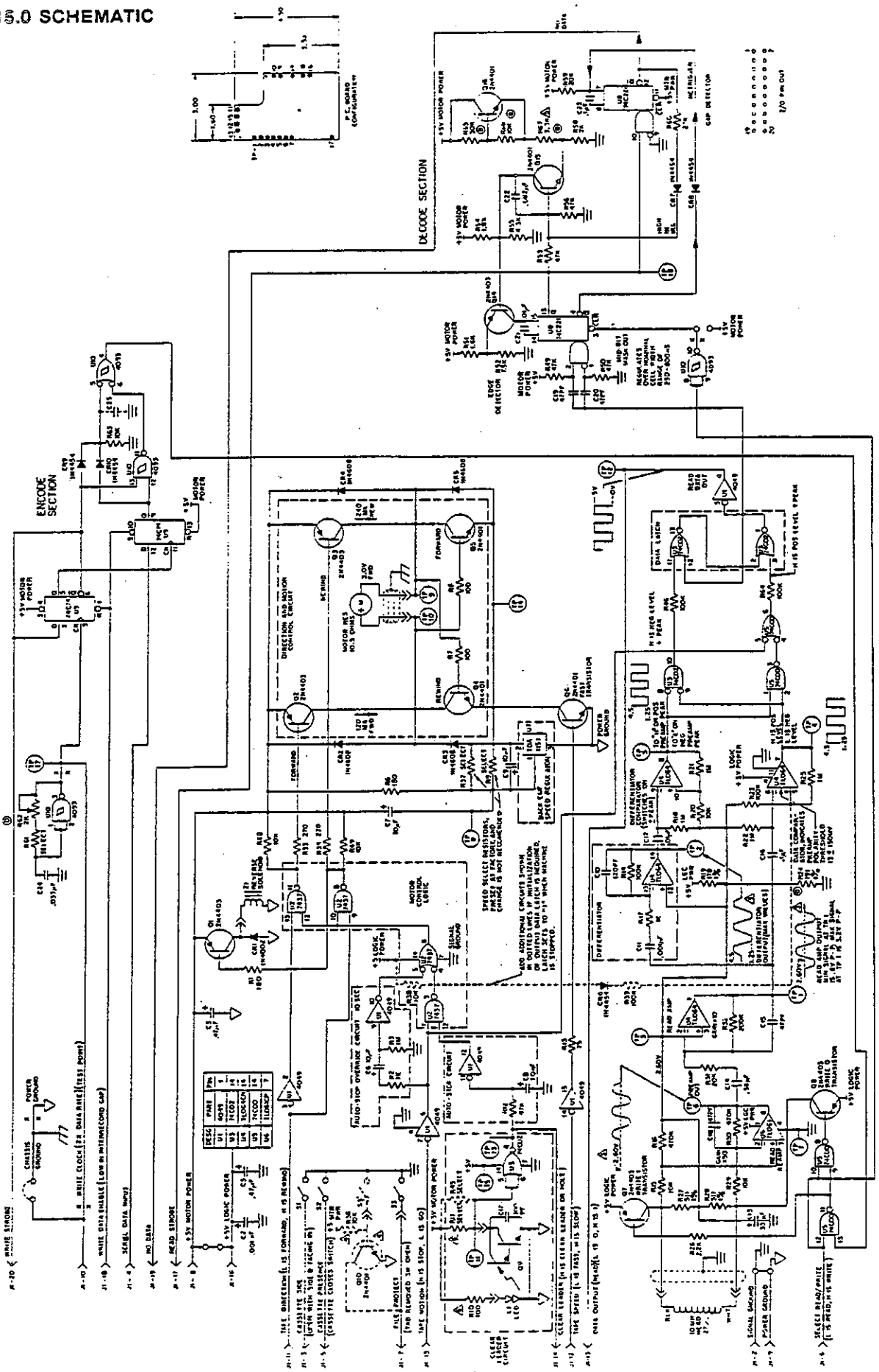
POWER, LOW VOLTAGE AR-548	P
D.S.D 7-27-94	SK-548



AR-609

R2-5-30-89 R1-4-10-87	CHARGER, GEL CELL, 13.8 VOLTS		S
	DSD CO 12-1-82		5

15.0 SCHEMATIC



⚠4 —INSTALL Q10 & R36 TO INVERT FILE PROTECT.

⚠3 —LEVELS VARY AMONG MACHINES AND FROM BEGINNING TO END OF TAPE. ALL WAVE FORMS SHOWN ARE FROM A CONSTANT 2400 BAUD SIGNAL IN READ MODE.

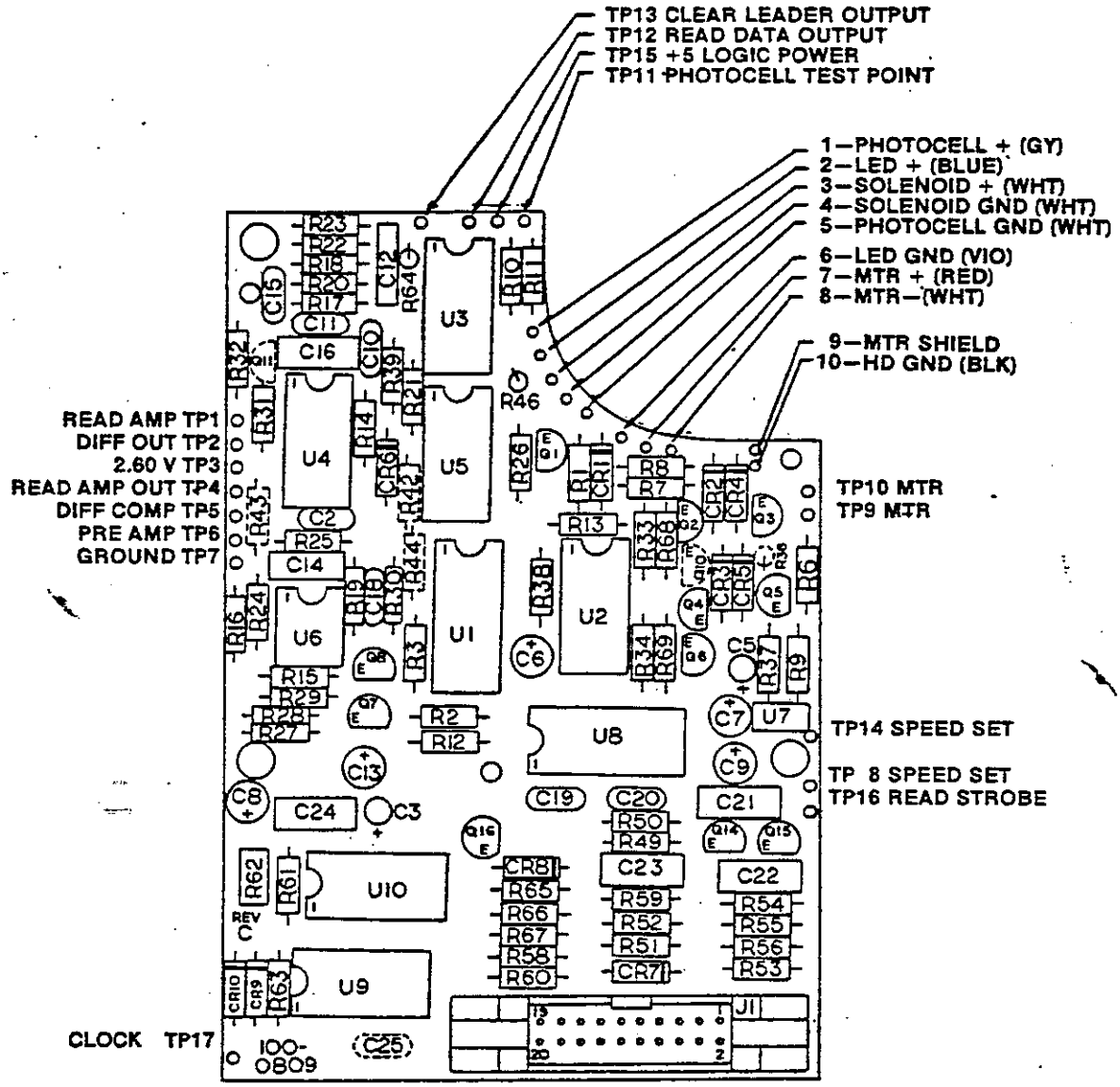
2 —SAMPLE DATA OUTPUT (J1-13) ON RISING EDGE OF READ STROBE (J1-17). DATA IS VALID FOR 1/2 OF BIT CELL TIME (APPROX. 208 µS AT 2400 BAUD).

⚠6 —R10 & R11 VALUES DIFFER WHEN INFRARED LEDS ARE EMPLOYED

⚠5 —ADJUSTMENT OF R67 MAY BE NECESSARY TO SET MASK WIDTH TO A VALUE BETWEEN 67% AND 75% OF THE DATA TRANSITION SPACING. THIS ADJUSTMENT SHOULD BE DONE AT INTENDED SUPPLY VOLTAGE.

BRAEMAR CM6000C CASSETTE RECORDER

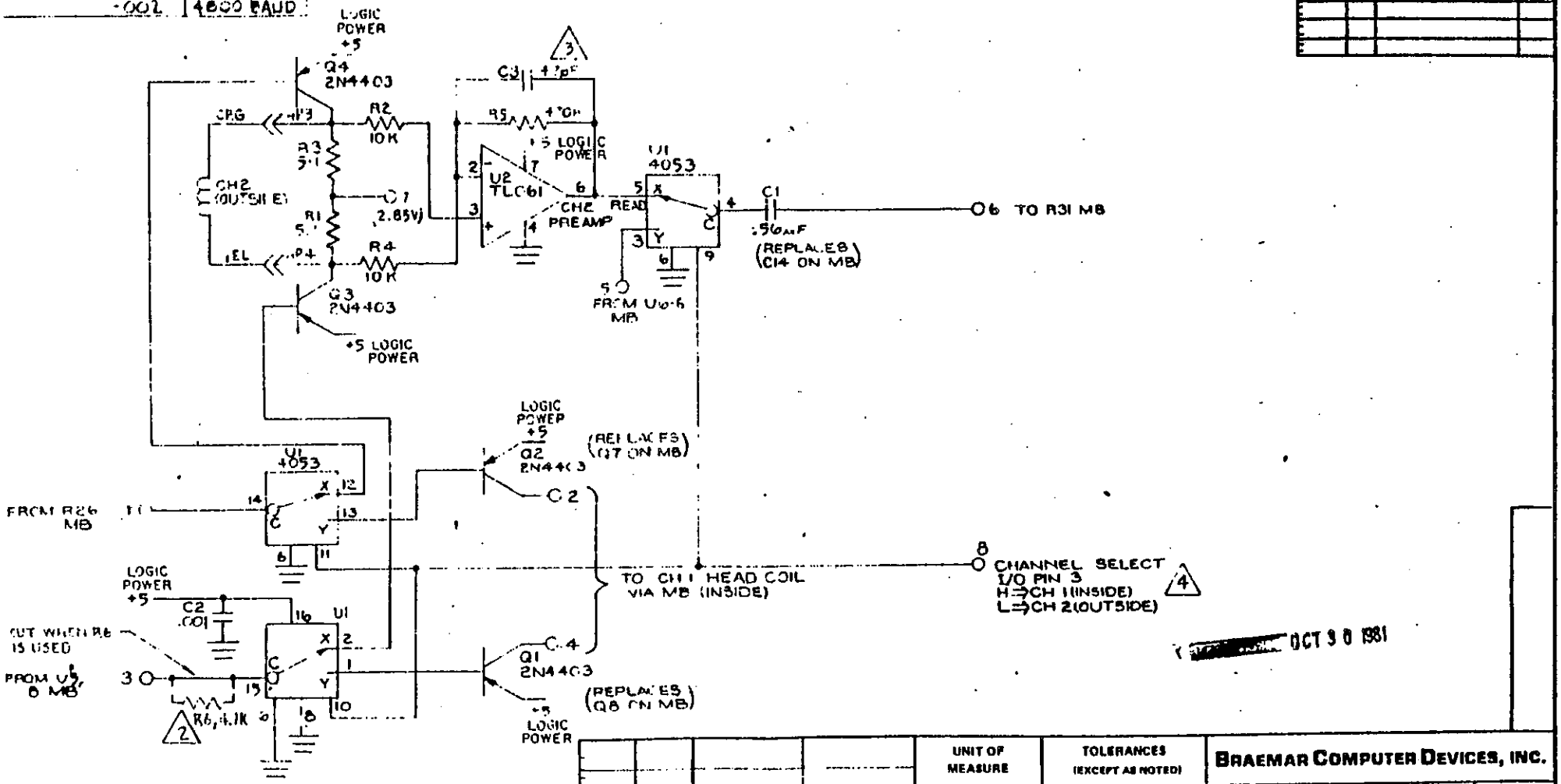
16.0 COMPONENT LOCATION PRINT



COMPONENT SIDE

PART NUMBER	DATA RATE
300-0427-001	2400 BAUD
-002	4800 BAUD

DATE	SYM	ECO NO.	APPR.
11-26-79	A	91144	T.R.



4 I/O PIN DESIGNATION ON MAIN BOARD IS IDENTICAL TO THAT FOUND IN MANUAL WITH THE EXCEPTION OF PIN 3

3 FOR -002 C3 IS 33PF

2 +12V OPTIONAL

1 = MB = MAIN BOARD

DESG	PART	GND	PWR	LAST REF DESG USED	DESG NOT USED
U2	TL061	4	7	24	
U1	4053	8	16	R1	
				C3	
				U2	

UNIT OF MEASURE	TOLERANCES (EXCEPT AS NOTED)
0.000 = MM / 0.000 = INCHES	DECIMAL ±.X = .50 MM/.02 IN. ±.XX = .25 MM/.01 IN. ±.XXX = .13 MM/.005 IN.
MAT'L.	FRACTIONAL ±1/32
	ANGULAR

BRAEMAR COMPUTER DEVICES, INC.

SCALE	DRAWN BY	JKD	10 OCT 79
	APPROVED BY		

TITLE: CM600 SWITCHING CIRCUIT SCHEMATIC-CH2

DWG SIZE	DRAWING NUMBER	PAGE
B	300-0427	2 OF 2

2056-B MultiChannel Analyzer

SPECIFICATIONS

LINEAR AMPLIFIER
- Unipolar spectroscopy amplifier with active baseline restorer and programmable shaping time constants of 1 and 3 μseconds.

PULSE PILE UP REJECTOR
- Selectable pulse pile up rejector with live time corrector.

ADC
- 100 MHz Wilkinson ramp ADC with programmable zero offset.
- Non Linearity
  Integral: ±.025% over top 99% of full scale.
  Differential: ±1% over top 99% of full scale.
- Zero Drift: ±.0025%/°C.
- Gain Instability: ±.01%/°C.
- Peak Shift: ±.025% of full scale at rates to 50KHz.
- Dead Time: .01xN+2+2 in μseconds (N=channel number).

HIGH VOLTAGE POWER SUPPLY
- Ramping dual range for NAI and Germanium detectors with remote shutdown.
- Positive and Negative 0 to 5000 volts for Germanium.
- Positive 0 to 1250 volts for NAI with selectable stabilization for Americium doped detectors.
- Regulation: ±.05%/°C.

DATA ACQUISITION
- PHA and MCS - 4096 channels with 2^24-1 events per channel. Programmable conversion gain of 1/8, 1/4, 1/2 or 1/1.
- PHA presets: Live time, Real time, Integral of ROI, and Area of ROI.
- MCS count rate: 100K per second.
- MCS dwell time: 1mS to 9000S.

DATA ANALYSIS
- 2 point energy calibration.
- Fractional spectrum stripping.
- 3 point Spectrum smoothing.
- 30 ROIs with calculations of Integral, area, energy of maximum and error.
- Peak search with a selectable search factor.
- Battery backed up data RAM with separate live time and real time for each memory segment.
- Unit number identification.

DISPLAYS
- CRT display with resolution of 2048 by 256 dots on a 7cm diagonal screen.
- Control of expansion, roll, cursor, and power.
- LCD display of 2 lines by 16 characters for parameters and instructions.

KEYBOARD
- Keyboard of 24 keys with positive tactile feed back.

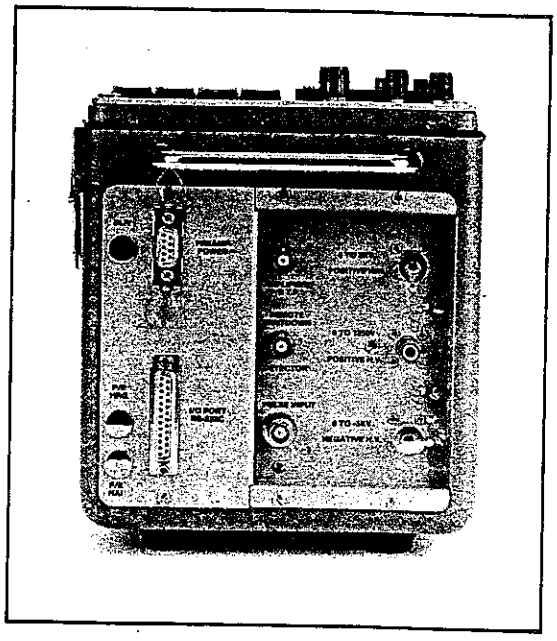
CLOCK
- Battery powered internal time and date clock for data logging.

I/O PORT
- RS-232-C port.
- BAUD rate: 110 to 19200.
- Protocols: XON/XOFF, Hardware stop, Software handshake.

DATA RECORDER
- Uses Certified Mini Data Cassettes.
- Built in true digital recorder using the Manchester phase encoding scheme.
- Capacity for 10 spectra per 80 foot cassette tape.
- Format: File number, ID number, time and date of acquisition, unit number, live time, real time, ROIs, parameters and channel data.
- 40 seconds for 4096 channels.

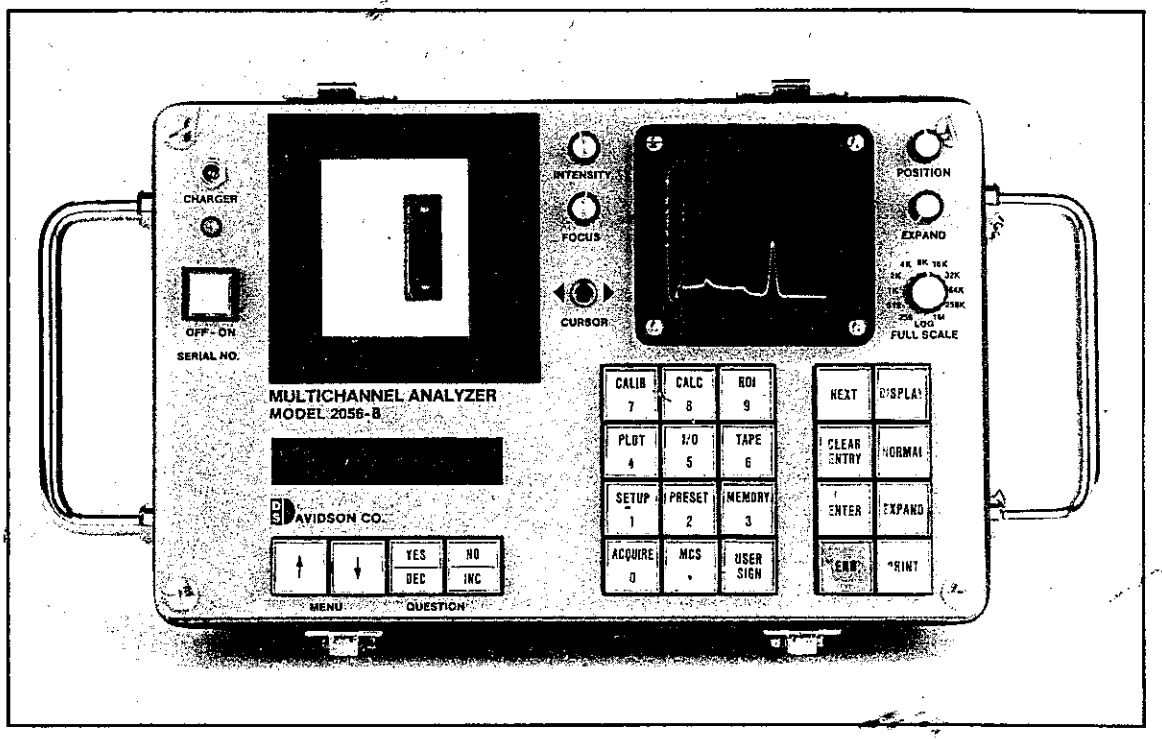
OPTIONS
- ±24 volts preamp power.
- Battery Pack
- ATA Transit Container
- Binary Data Transfer
- Cassette Reader

PHYSICAL
- Size: 7"x11"x9" (178mmx279mmx229mm)
- Weight: approximately 16 lbs (7.2 kg)
- Power: Internal 12 volt rechargeable GEL CELL battery.
- Battery charger included.
- External Power supply: 10 to 14 volts from external battery pack or charger.



Davidson Co. Inc.
19 Bernhard Road/North Haven, CT 06473 USA/(203) 288-7324

2056-B MultiChannel Analyzer



The 2056-B MultiChannel Analyzer is a portable easy to use battery powered instrument. Designed for field use, yet it is convenient and powerful in the laboratory. Data acquisition applications include Pulse Height Analysis and MultiChannel Scaling, as standard. This instrument had its beginning at the Los Alamos National Laboratory. The laboratory has monitored the development at the D.S. Davidson Company and then evaluated the final design. The MCA's proven performance has lead to its selection and use by several agencies to perform inspections around the world.

Though small in size the MCA is a complete 4K analyzer system providing the amplifier, preamp power, high voltage, and digital recorder. Just add a detector of your choice, Germanium or Nal with a low power preamp, and your system is capable of a full day's work in the field.

The internal battery can power the MCA for 10 hours on a full charge. Tests have shown that under real operating conditions, providing pre-amplifier power and high voltage to a HRG low power preamp detector and using occasionally the CRT display, cassette recorder and RS-232-C port the operating time is greater than 7.5 hours at 25 degrees centigrade.

Performance in a wide range of field applications is possible with features such as a 100 MHZ ADC, a good low noise unipolar amplifier with active base line restorer and pulse pile up rejector. Essential to most applications, the cassette recorder is a simple and reliable means to save data. The built in cassette recorder only requires a simple key sequence to record the entire spectrum with parameters and ROI information. Different detector and I/O configurations are easy since no internal strapping is required. All parameters are selectable by the keyboard or read from tape. The internal electronics never needs to be removed from the box, all the necessary adjustments are accessible through the side cover.

The internal CRT provides enhanced analysis of spectra with a resolution of 2048 by 256, four intensities, digital and analog expansion with roll, automatic power down after 4 minutes and twinkle during acquisition for locating activity.

Provisions for external control using the RS-232-C port are included as standard. The new battery operated computers will provide a powerful means of data reduction on site. Virtually all the functions of the MCA are controllable making a portable turnkey system possible.